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Vol. VIII. NEW YORK, AUGUST 21, 1886. No. 8.

ONCE more the air is chick with rumors telephonic. We are told that Gray's caveat has been reinstated in the Patent Office; we are told that it has not been reinstated. Prof. Gray is said to be making terms with the American Bell Company, and Prof. Gray himself denies the report. It is alleged that most of the stories have been set afloat for stock-jobbing purposes. We shall see.

THE curious manner in which the features of a young lady were reproduced lately at Plainfield, N. J., upon a polished tray, during the brief display of a brilliant flash of lightning, recalls the experiments of M. Mareschal, described and illustrated in THE ELECTRICAL WORLD of Feb. 28, 1885. The close connection between the two is apparent, for M. Mareschal succeeded perfectly in obtaining photographs of electrical discharges directly upon a sensitive plate without the employment of a camera. It would be interesting to know the exact conditions which brought about the effects observed in the recent case, but probably few would be willing to pose for their photographs under the trying conditions involved.

WE regret to note the destruction by fire of one of the Brush stations in this city. The fire was not due to any electrical trouble, but arose, it is said, from friction of the shafting. The company was giving excellent service, and has our cordial sympathy in its mishap. The building, which had been an old soap factory, and was greasy from top to bottom, was not the one we should choose for an illuminating station of any kind—certainly was not one that would come within the scope of the new Mutual company now organizing to insure electric lighting plants. When the company rebuilds, or renews its plant, it will probably show what can be done in the way of fine stations. One noticeable feature of the fire has been the promptitude with which the officers have set about to repair the damage, and the ease with which the circuits of the disabled plant have been taken over by that on the other side of the city. We do not know of any other system of artificial lighting by which such a transfer of work could be made, and it is this flexibility that is in itself a great recommendation.

THE latest invention in the electrical field is a "perpetual electric generator or motor," which, according to the inventor, "will propel itself by its own current, the resistance of the generator proper being about 10 per cent. of the rotary power of the electric engine upon which the current of of the generator acts." The machine is said to differ in all respects from dynamos of present construction, except in that it also contains wire and iron, and weighs about 300 pounds. We leave our readers to build up the machine in their imaginations, from the slight framework of construction just given. Somewhat Utopian, though not on the same level with the perpetual motion machine above described, is a second machine which has also recently been "invented." The latter operates without any visible field magnets, utilizing the magnetism of the earth as the inducing force. The generation of a current by moving conductors in the earth's magnetic field is a very pretty lecture-room experiment, and although it has been suggested that the earth's magnetic field might be employed for the purpose of generating currents commercially, we hardly believe that that time has yet come for it, or indeed that a necessity will ever arise. We cite these cases only to show from what various sides and how strangely the problem of the cheap production of electricity is being attacked.

As the time draws near for the convention of the National Electric Light Association at Detroit, the exhibition of interest promises a large attendance and a season of much pleasure and profit. The various matters to be brought before the convention are important, and it is desirable that they should have the fullest discussion at the hands of the practical men upon whose work rests the success of electrical applications. The rapid growth of the business brings up new problems almost daily, and these should be solved as they come to notice. The Association naturally affords an arena for full and useful discussion of all the topics connected with electric lighting, and it is for their own welfare that all interested in arc or incandescent lighting should not only become members, but attend the meetings, and by contributing their experience, add to each other's effectiveness and the return on the general investment. We are glad to know that this view, which we advanced even before the Association was formed, is gaining ground, and that the Association bids fair to become one of the most prosperous and influential bodies of its class. We believe that the Detroit meeting will be specially helpful and stimulating from the fact that Eastern and Western members will be brought in close and friendly contact. Elsewhere in our columns will be found the latest notifications in regard to preliminary arrangements.

NOTWITHSTANDING the fact that Wheatstone demonstrated the duration of a lightning flash to be less than $\frac{1}{14000}$th of a second, and that recent investigations put the figure at even less than a millionth, the question has been raised whether these figures are trustworthy. It seems that a photographer by using a sensitive plate on a very dark night, obtained a picture of outside objects by the aid of lightning alone. The wind was strong and the fact was brought out that the foliage had perceptibly moved during the exposure. From this circumstance it is reasoned that the duration of the flash must have been decidedly longer than that usually assigned to it. Assuming the camera to have been perfectly stationary during the strong wind, the motion of the leaves developed ought not to be taken as a measure of the duration of the flash, as this occurrence can be fully explained, even supposing the flash to be one millionth of a second in length. To explain the motion of the leaves we need only assume that more than one discharge took place, and that between the intervals the leaves had moved. If the flashes had succeeded each other in only one-tenth of a second the observer would have been unable to distinguish them on account of the persistence of vision. Hence two flashes, of a millionth of a second's duration, at the interval of one-tenth of a second might easily have produced the effect shown in the photograph. It would, therefore, be rash to conclude that the duration of a lightning flash is so materially less than is generally accepted to be the case.

PROBABLY the most notable step toward progress and improvement in the telephonic field is that about to be undertaken by the enterprising Metropolitan Telephone Company, of this city. The project is nothing less than to concentrate the lines of over 6,000 subscribers in one office, for which a special building is now being erected. This gigantic undertaking calls for the exercise of great ingenuity, and will require special arrangements for handling business. These details have to a great extent already been worked out. One matter for congratulation in the new arrangement is the wise policy of preparing for the complete metallic circuit. With the approaching burial of the wires, no other course seems possible, and we are confident that the company's patrons will contemplate with pleasure the removal of one of the most fruitful sources of complaint—induction. The company deserves credit for being the pioneer in this country in this movement, which will, we predict, eventually become universal, whether for underground or overhead lines. The expense involved in this change, as may be imagined, will be a heavy one, and the work may occupy considerable time in its completion, but eventually New York will be able to boast of the largest and most complete telephone equipment in the world. It may be interesting to note here that the board will cost about $120,000, exclusive of wiring, which will be in itself no small matter, as it is calculated that there will be about one and a half million soldered connections. The board will start off with actual provision for over six thousand subscribers.

THE offering of a prize of one hundred guineas for the best design of an electric motor is an event which will naturally attract attention just at this time, when the transmission of power by electricity is becoming more and more the favorite method among the several which can be chosen. A good motor is undoubtedly one of the principal factors in the successful application of such a system, but while admitting that good motors exist at the present time from a theoretical point of view, the donors of the prize contend that those at present in use do not fulfil the conditions dictated by practice and that they labor under the "disadvantage of running at too high a speed, having too great a weight and costing too much money." With the object of removing the first two alleged disadvantages the conditions are such that the speed of the motor shall not exceed 250 revolutions per minute and that it shall not weigh more than 950 pounds, *i. e.*, 95 pounds per horse-power developed. We fail to see the necessity for thus limiting the speed of the motor, for while it does not of itself limit the speed of the armature to that figure, the use of any intermediate gearing is a decidedly bad feature from a practical standpoint. Under the conditions given, however, we hardly see any other way of accomplishing the desired reduction in speed with the efficiency of 80 per cent. demanded. Such an efficiency in a motor is sufficiently exacting without the introduction of an additional factor of loss; and a speed of 250 revolutions in the armature itself would probably make the fulfillment of the other conditions of weight and efficiency impossible. We see no good reason at all why the speed should be limited to 250 revolutions per minute, which the prize-givers deem so essential. It is certainly better to gear down from a high speed to a slow than to try the reverse; and if we seek for an analogy we need only look to the popularity of the high speed steam engine, the great merit of which lies in the fact that it obviates the necessityof intermediate gearing and in its small weight for a given power. A speed of from 800 to 1,200 revolotions in a motordoes not appear excessive to us; certainly such speeds are quite common to-day in electric power installations and we have still to hear of a complaint on that score. While we are satisfied of the true scientific spirit imbuing the givers of the prize, we are half afraid that they have made their conditions too exacting by introducing unnecessary factors and that it will require an extraordinary and unnecessary combination to meet them successfully. The composition of the board of award, however, is such as to assure an impartial verdict and we hope that the offer of the prize will give rise to a vigorous competition.

Water-Power for Electric Lighting.

A very interesting illustrated description was given in the last issue of THE ELECTRICAL WORLD of the water-power applied to electric lighting in Guatemala, and it was stated that the results had been so satisfactory as to lead to an extension of the system. There is no longer any doubt as to the fact that one of the uses of electricity is to prevent the great waste that still goes on, of natural power. Some day even the tides may be utilized, as many inventors have already proposed, but meantime there is much to be done in turning into electric current the energy developed by the fall of water on rivers and streams in all parts of the country. What has already been done, though little known, is of the most encouraging character.

At the present time, there are between forty and fifty American or Canadian electric light plants depending largely—in many cases, wholly—upon water-power. At Rochester, N. Y., the Brush Electric Light Company gets a total of 2,700 horse-power from three Leffel and two Victor turbines, and has been erecting a new station with 3,000 horse-power additional. With the capacity first-named, it has been furnishing over 700 Brush arc lights. The Rochester Electric Light Company, with 300 arcs of the United States system, also has water-power. Auburn, N. Y., has a Jones' "Little Giant" water-wheel of 100 horse-power, with which the local company operates a good many of its Thomson-Houston lights. At Niagara Falls, the local Brush company has a 400 horse-power wheel. Holyoke, Mass., is noted for its fine water-power, and it is not surprising, therefore, to find that the 200 Schuyler lamps there are run by it, the Water-Power Company having erected and equipped a special building for the plant. At West Somerville, Mass., a small incandescent plant is run by water-power, and at Laconia, N. H., the Laconia Electric Lighting Company, with over 300 Edison lights has water-power also. Skowhegan, Me., uses water-power exclusively for its Schuyler lights.

These are, perhaps, the most notable examples in the East, although just over the border, in Canada, some striking instances may be found. Thus Dunnville, Ont., with Thomson-Houston lights, buys 100 horse-power, water at the rate of $40 per annum, without any charge for the wheel. Galt, Ont., again, with the Thomson-Houston system has water-power for its one hundred lights; and the same may be said of Napanee, with 25; Ottawa with 300; Hutton with 50, three and a half miles from the power; Pembroke with 45 of the United States system; Port Hope with 35 of the Ball system and St. Catharines with 70 of the Thomson-Houston. The plant at Peterborough, Ont., with a capacity of 100 Thomson-Houston lights, has four Leffel turbine wheels, 52-inch circumference, under 14-foot head; in all a capacity of 300 horse-power.

Little has been done in this respect in the South. Lynchburg, Va., with its Knowles-Moffat arc system has the largest southern installation, we believe, depending on water-power. Columbus, Ga., runs about a score of Brush arc lamps with water-power, but little is known of any other case. In the West, however, such plants are numerous. The United States plant at South Bend, Ind., depends mainly on the water. The Brush Company at Aurora, Ill., running from 130 to 150 arc lights, has two engines and a water-wheel. The Elgin, Ill., Edison Company has been running to the full capacity of its water-power for 800 lamps, but has fallen back on steam. At Sterling, Ill., the dynamo for some 30 Van Depoele lamps is run by water; and 55 Thomson-Houston lights at Ottawa, Ill., depend also on water. In Michigan, the electric lighting plants at Big Rapids, Thomson-Houston; Alpena, Brush: Grand Rapids, Brush, Fuller and United States, are all run by water. The Crookston, Minn., Water-Works, Power and Light Company, runs a Van Depoele plant of about 70 lights. The Union Company at Minneapolis has been utilizing the fine power there for United States incandescent lamps. The Beatrice, Neb., Electric Works have a capacity of 40 Van Depoele lamps and a Victor turbine. In Wisconsin water-power is largely availed of, as at Appleton, where it is running an Edison plant and will be used also for an electric street railway; at Eau Claire, where the Brush company has 130 arc lamps and an American turbine wheel, 48-inch circumference and 16-foot head, while the Excelsior plant there has 65 lamps dependent also on water-power; at Wausau, where 150 Edison lamps are run by it, and at Janesville, where a Thomson-Houston plant of over fifty lights has been run very successfully.

To the above may be added the Fuller plant of over 200 lights run by four Stilwell & Bierce turbine water-wheels, at Dayton, O. In the far West a little has also been done. At Aspen, Col., the electric lighting company has put in a water-wheel of 150 horse-power for arcs and incandescents; Ogden City, Utah, runs its 90 Brush lights by water-power five miles away, and the Spokane Falls, in Washington Territory, operate a dozen Brush lights, and probably, by this time, a good many incandescents. Altogether, the showing is much larger than one would expect. In several places where water is thus used steam engines stand ready as relief, and the precaution is reasonable. But from all that can be learned, the water-power has been reliable almost without exception, and there is a marked tendency to utilize it for lighting and other purposes.

The Knudson & Ellsworth Acoustic Telephone.

It was only after he had seen for the first time the string telephone, or "lover's telegraph," that Elisha Gray realized the possibility of transmitting articulate speech over a wire by electricity. This circumstance establishes a certain family relationship between two distinct and equally useful inventions. It makes them both "lineal" descendants from the same stock, as it were. One of these inventions, the electric speaking telephone, is an old acquaintance of the public and of our readers, but the other, the acoustic telephone, can scarcely be said to be on "speaking" terms with such a large circle of acquaintance as its more fortunate cousin, its début having been made at a comparatively recent date.

In the first, articulate speech is transmitted over a wire under the guise of electrical undulations or vibrations; in the second, the speech is transmitted by the direct propagation of sonorous undulations or vibrations over the line. The fascination of any method involving the agency of electricity was in this case, as in many others, sufficient to captivate and monopolize the attention of countless prospectors in the field of invention; while the string telephone, like the proverbial poor relative, was forced to remain in the background, unnoticed and almost forgotten. Of late years, however, its right to recognition has been admitted, and the study of the possibility of acoustical telephony has been begun and pursued in earnest, the results already attained being sufficiently encouraging to insure sustained efforts in the work of development. The acoustic telephone has not the same power to compass distance as its more pretentious namesake, but even within its limitations it can and does occupy a field of almost infinite usefulness.

KNUDSON-ELLSWORTH MECHANICAL TELEPHONE.

Messrs. Knudson & Ellsworth, of this city, were among the first to devote attention to acoustic telephony, and their apparatus was one of the first occupants of this new field. The apparatus shown in the illustration, represents the latest and most improved type of their acoustic telephone, and contains several new and interesting details.

While the problem of acoustic telephony does not include such trying factors as the undulatory current of Bell's patent, not to mention the electrical and mechanical difficulties, it is not, for all that, as easy of solution as a glance at the simple string telephone would lead one to imagine. It is, on the other hand, beset with its own trials and troubles, and fraught with not a few "unknown quantities." These difficulties appear at every point; in the instrument itself, to make it sensitive to the voice yet deaf to extraneous sounds; in the line, to make it sonorous and ready to transmit words, but not noises or vibrations found "on the wayside;" in the installation, to insulate or rather isolate the line, turn corners, maintain tension, etc.

Messrs. Knudson & Elsworth have evidently investigated all these and many other difficulties with great care. The diaphragm, for instance, appears to have been itself the theme of a most exhaustive study. From our conversation with Mr. Knudson we gather the knowledge that almost every material or combination of materials under the sun has been carefully experimented with. The diaphragm should combine resonance, sensitiveness to vibrations, coupled with strength and durability, indifference to atmospheric changes, etc. These requirements seem to have been best fulfilled by the diaphragm which they now use. It is made of wood, not in one piece, but of several thin layers of woven or plaited strips, cemented together.

In regard to wires for acoustic telephones, it may be said that Messrs. Knudson & Ellsworth have also made exhaustive experiments which have led to a discovery as useful as it is strange. As these gentlemen have applications for patents pending, we must refrain from details, but we may nevertheless point out as a curious analogy or coincidence that their experiments recall to mind the late experiments of Prof. Hughes on the "extra currents" of wires. It appears that while certain arrangements of conductors are found by Prof. Hughes to be the best for electric telephoning, by eliminating self-induction, etc., equivalent arrangements in the "circuits" of acoustic telephony serve the purpose of eliminating *extraneous noises*, such as from "extra currents" of air, etc.

This telephone is already in extensive use, and has been carefully tested by eminent electricians both in this country and Europe. Many indorsements of a favorable nature are given it. Among them may be cited those of Mr. Preece, F. R. S., Electrician to the Post Office Telegraph, London; C. E. Spragnoletti, President Society Telegraph Engineers, and Henry Sach, Esq., Telegraph Engineer and Superintendent Great Eastern Railway Company.

National Electric Light Association.

We publish below two letters that give information in regard to special transportation rates to Detroit:

A. De Camp, Esq., Chairman Executive Committee, National Electric Light Association:

DEAR SIR: Certificates for reduced rates to the Detroit Convention are now ready, and can be had upon application to me, as follows: Via New York, Lake Erie & Western R. R., from New York to Suspension Bridge, fare for round trip $13.90. These certificates will be honored at any office of the company in New York City.

Delegates coming via New York should apply at once. Unless the Western Trunk Line Committee make the promised reduction (which, if made, will be announced this week), delegates will be obliged to purchase the regular ticket at Suspension Bridge to Detroit and return, and will have ample time to do so at Suspension Bridge.

The seven o'clock train from New York on Sunday, August 29, is the best train to take, arriving in Detroit at 1.30 P. M. Monday. I can tell better after certificates are issued what reduction can be made with Pullman Palace Car Company for sleeping car accomodation.

S. A. Duncan, of Pittsburgh, Pa., of the Commiltee on Transportation, will issue certificates from Pittsburgh to Detroit and return—fare, $9, via Pennsylvania Railroad—to such of our members as are near that point.

Mr. L. M. Fishback, St. Louis, Mo., of the same committee, will issue certificates, via Wabash system, to those of our members in his locality.

There will undoubtedly be further reductions that will be announced by circular this week.

Let the fraternity turn out in full force.

Yours truly, J. F. NOONAN, Chairman.

PATERSON, N. J., Aug. 16, 1886.

August 11, 1886.

Geo. S. Bowen, Esq., 196 Jackson St., Chicago, Ill.

DEAR SIR: Your letter addressed to Mr. T. H. Dearborn was brought up at the meeting of the Chicago East-bound Passenger Committee to-day, and it was decided that as your association does not come within the rules of our Committee for granting reduced rates, no reduction could be made. Personally, I regret this, as I would have been glad to have seen you go at a reduced rate, but you know that we must try and be consistent, and several associations of a similar character to yours have recently been refused any reductions. Very truly yours,

(Signed) GEO. H. DANIELS,
Asst. Commissioner.

The Electromotive Force of Alloys.

In a paper recently read before the Chemical Society on "The Action of Metals on Acids," by Henry E. Armstrong, the author remarked that knowledge of the nature of alloys is at present very limited; it is supposed that some metals are capable of combining, but that others form mere mixtures when fused together—the alloy being, as it were, "a solidified solution of the one metal in the other." This differentiation is based on the study of physical properties of alloys in comparison with those of the constituent metals. It appeared possible that, by dissolving alloys in a liquid capable of acting on both metals and determining the electromotive force between the alloy and a less positive metal, evidence of the existence of definite compounds might be obtained if the alloy dissolved as a whole. The general result, however, obtained by experiments is that the method is inapplicable, since the alloys do not, as a rule, behave as wholes. The electromotive force observed in several classes is very nearly that between the less positive metal of the alloy and platinum, the more positive constituent dissolving independently and giving rise to a local circuit; thus in the case of copper-zinc alloys the electromotive force is very nearly that of copper, as long as the alloy contains not much less than about 5 per cent. of copper; the tin-zinc and tin-copper alloys also have an electromotive force near to that of the less positive metal until alloys are reached containing but a small proportion of this constituent. In mercury-zinc alloys the more positive metal determines the electromotive force; this apparently is also true of the lead-tin alloys. Slight changes have been observed which, if confirmed by further experiments, are probably significant; thus in the tin-zinc alloys the electromotive force gradually rises

from that of tin as the amount of this metal in the alloy diminishes; it is conceivable that this may be because the zinc acts as a diluent and separates the more complex tin molecules into simpler, more active molecules. On the other hand, the electromotive force of copper in bronze is slightly lower than that of pure copper, and that of copper in the copper-zinc alloys rich in zinc is also a little lower than that of pure copper; this may be due to the loss of energy in the formation of the alloy.

A New Fast Printer.

The ingenious system of synchronous multiplex telegraphy of Messrs. Delany & Callahan, by which six and more messages can be transmitted simultaneously in either direction over one wire, and which has been already described in our columns, is admirably adapted to printer service and is destined to early and wide application. As is well known, the quadruplex is almost exclusively used for private line communication between distant points at present. But as the subscriber must be able to send or receive at will, and as but two messages can be sent simultaneously in one direction, it follows that one wire can be rented out to only two parties.

In order to adapt the synchronous system to the purpose of private lines without the necessity of employing a skilled telegraph operator, Mr. R. G. Brown, the electrician of the Standard Multiplex Telegraph Company, has designed a new fast printer by which six or twelve of these instruments can be operated simultaneously in pairs over a single wire, each pair forming a practical circuit.

It will be remembered that in the synchronous system the main line terminates at a "trailer" which rotates synchronously over a circle of 84 segments, 12 of which are devoted to maintaining the trailers in synchronism, leaving the remaining 72 segments or contacts for operating purposes. Groups of 6 or 12 of these contacts, according to the speed at which the printer is to work, are connected to ground through relays of special construction located in the motor office. From each of these relays wires branch off to the printing instruments situated in the brokers' offices.

The printer is similar in many respects to the well-known "ticker" or quotation instrument, but is provided with a key-board of thirty keys corresponding to the thirty characters of the type wheel. No batteries, relays, bells or other apparatus are required in the subscribers' offices, the motive power of each printer being derived from a weight which gives motion to a train-work carrying the type wheel controlled by a magnet. This magnet is actuated by the special relay and branch wire before mentioned.

When it is desired to send a message, the operation is as follows: The subscriber turns a small switch which connects the main battery (situated in the motor office) to the contacts devoted to his use, and as the trailers (which are the terminals of the main line) rotate over the circle of segments, the main line is completed through the special relays to ground each time the trailer passes over a segment. As these trailers make three revolutions per second and assuming a subscriber to have 12 contacts in the circle of contacts, it is evident that his special relay has been put in connection with its corresponding relay at the distant end 36 times during each second. And as these relays actuate the printer magnet, which in turn permits the type wheels to rotate one letter each time it is so actuated, it is clear that 36 letters have passed a certain point during each second; or 2,160 during a minute. There are 30 characters on the type wheels; consequently it makes 72 revolutions per minute. When it is desired to take an impression from the type wheel, the operator simply depresses the desired key which disconnects the battery from the contacts and so brings the type wheels to a stop. This causes the "press," which carries the strip of paper, to strike the type wheel, taking an impression of the letter corresponding to the depressed key. On releasing the key the main battery is again connected to the segments, and the type wheels are again set in motion.

When six segments are employed, it is evident that while the system and operation remain the same, only one-half the speed is obtained. In other words, where 12 segments are used for a printer, 30 words per minute can be transmitted, while with 6 segments 15 words per minute is the average.

The Electric Tramway at Hamburg.

We have already had occasion to note the opening of a tramway in Hamburg, Germany, in which the motive power consisted of storage batteries carried by the car, and we are now enabled to give a more detailed description of the system, which is that of M. Julien, whose successful experiments at the Antwerp Exhibition we have already chronicled.*

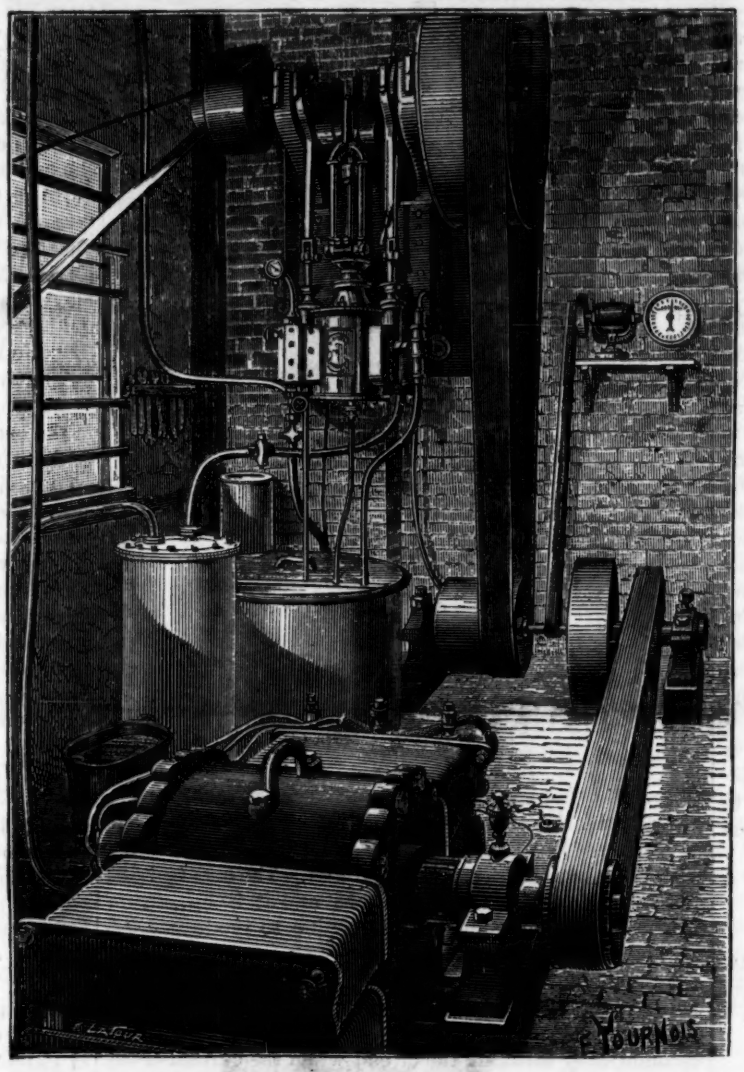


FIG. 1.—HAMBURG ELECTRIC STREET RAILWAY—GENERATING STATION.

The car employed at Hamburg is built to carry 33 passengers, and weighs when fully loaded 4,830 kilogrammes. The accumulators alone weigh 1,200 kilogrammes. The battery consists of 96 elements, each of the latter being formed of 15 plates, 7 positive and 8 negative. The surface of the plates is relatively small being only 134 × 149 mm.; they are 4 mm. thick.

The elements are grouped by threes at first, and then four of these groups, *i. e.* a dozen elements, are placed in a separate box. As shown in the engraving, Fig. 2, the boxes are placed in the side of the car, being eight in number, four on each side.

A very simple method of changing the accumulators has been adopted by Herr Huber, the engineer of the company. When the cells are nearly discharged, the car is run into a shed up to a platform, which is on a level with the bottom of the boxes. The latter are then slid out, and the car is moved along opposite a fresh set of accumulators which are quickly substituted. No contact or connections need be made by hand, as the mere act of inserting the cells causes the proper connections to be made automatically.

This is accomplished by means of strong springs, which make contact with terminals on the cells as they are slid in, and from which conductors lead to the multiple switch on the platform of the car.

The switch is so constructed that the cells can be grouped in various ways so as to give respectively 48, 96, 144 and 192 volts E. M. F., which correspond to different speeds of the motor and obviates the use of resistance coils.

The installation for charging the batteries occupies but a very small space and is shown in Fig. 1, for which, and the former one, we are indebted to *La Lumière Electrique*. A small vertical steam engine is mounted on the wall and belts to a countershaft which drives a dynamo of the Schwerd pattern. In addition, there is a Buss speed indicator and the necessary voltmeters and ammeters.

The cars run a distance of 100 kilometers (about 65 miles) a day, and require two sets of cells per diem. The normal strength of current on a straight level is 10 ampères but on curves and heavy grades it can be increased to 80 ampères.

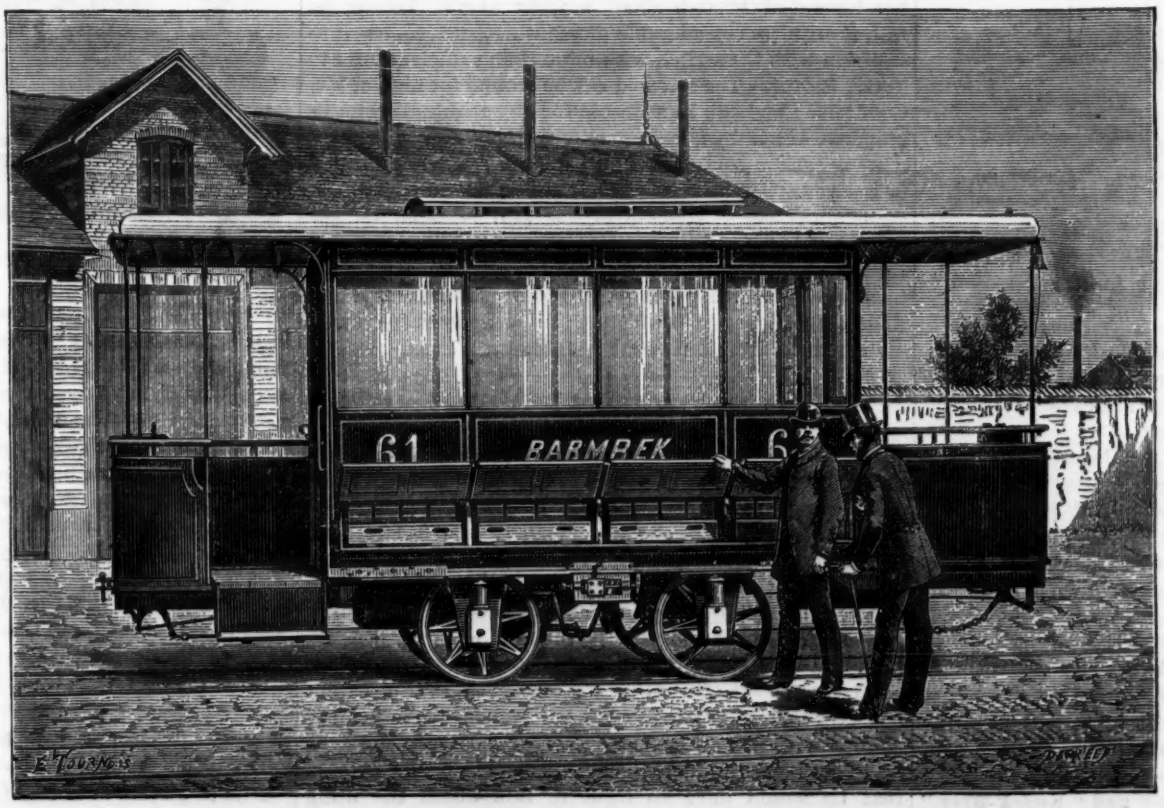


FIG. 2.—CAR OF HAMBURG ELECTRIC STREET RAILWAY—STORAGE SYSTEM.

* THE ELECTRICAL WORLD, March 20, 1886.

Electricity and Shafting.—A Simile.

For purposes of illustration, writes Mr. W. Moon, in the London *Electrical Review*, the electric current is frequently likened unto the flow of a fluid. But the hydraulic simile has the disadvantage of suggesting the actual transport of something ponderable, while there is every reason to believe that nothing but energy is transported.

A simile which is free from this objection may be drawn between the flow of electricity and the motion of a system of shafting. Thus the fact that the current strength is the same in all parts of the circuit may be illustrated by the rotation of the shafting, which is the same throughout, while the linear velocity (say of the centre of gyration) illustrates the strength of the current, and the angular velocity the density of the current. In an electric circuit heat is generated throughout by the resistance of the conductor; in a similar manner the friction of the shafting at its points of support generates heat throughout its length.

The torsional strain of the shafting well illustrates an electric potential; while at points of the shafting where work is performed the difference of the torsional strain illustrates the corresponding difference of potential at points where work is performed in an electric circuit. In like manner the electric inertia of the circuit may be illustrated by the inertia of the system of shafting.

Pan-Electric Litigation.

Messrs. Morris, Earle and Pugh, as solicitors for Attorney General Garland, filed his answer at Washington on August 16 to the bill recently filed by J. Harris Rogers against Attorney General Garland, Senator Harris and others for a settlement of the affairs of the Pan Electric Telephone Company. Mr. Garland in his answer denies in detail every material statement in the bill and calls attention to "the scandalous and impertinent matter in the bill," and says he must decline to answer such portions unless the Court directs him to do so. The Attorney General is willing to account for all pecuniary benefits and money he has received from said company, or by reason of his interest therein. and to bring said moneys into Court when thereunto required. As to most of the matters set forth in the complainant's bill of complaint he has no knowledge whatever, and has no information as to the bill of complaint, and leaves the complainant to prove the same as he may be advised, Mr. Garland seems to think that if there is any injured person, it is he.

The Providence Telephone Exchange.

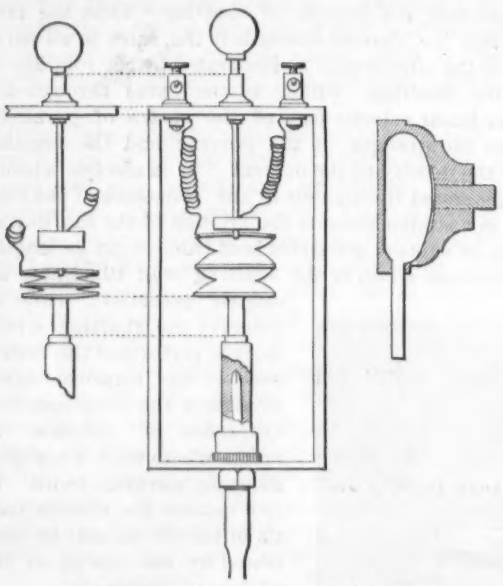
The Providence *Journal* of August 8 contains an interesting article on the local exchange. It says:

The exchanges operated by the Providence company are the central office and those in Olneyville, Pawtucket, Woonsocket, Attleboro, Warren, Bristol, Pascoag, and Westerly. The subscribers of all these exchanges are allowed unlimited use of the wires in the whole territory. There are 2,200 subscribers connected directly with the room in Butler Exchange, and as Providence is the business centre of the territory, the office in this city is virtually an exchange in which the total number of 3,250 subscibers is centred. An average total of 20,000 connections are made daily in this office, and the time of making connections averages a fraction over a minute between all points in the territory. This prompt service has only been attained by the adoption of all the latest improvements and by constant experimenting by the company's electricians. Probably the most convincing proof of the success of their efforts in this direction is the fact that whereas in the earlier period of the company's existence there was universal dissatisfaction among the subscribers in consequence of poor service, with frequent orders to remove instrument, at the present time complaints are few and applications for connection are made daily, without solicitation by the company. The rapid growth of the business in this territory is shown by the increase in the number of instruments in use. At the beginning of the year 1881 the number rented by the company was 802, and at the present time the number exceeds 3,250. They have over 2500 miles of lines in operation, and have a large number of cables of from thirty to fifty wires each extending to subscribers within short distances of the office. These lines are all constructed in the most thorough manner, and the company is constantly adding to its property in this direction,

The subscribers of the Providence Exchange can have their lines connected with the lines of the American Telephone and Telegraph Company, and are thus enabled to converse with all subscribers to other exchanges in Massachusetts, Connecticut and in New York city.

A Novel Temporary Lighter.

In a recent number of *L'Electricien*, M. Hospitalier describes an ingenious little device of his design, the object of which is to maintain an incandescent lamp alight for a



TEMPORARY INCANDESCENT LIGHTER.

certain time, after which it is automatically extinguished. Such an attachment connected to a hall light or upon the head of a staircase, dispenses with all care of turning off the lamp.

The apparatus is shown in detail in the accompanying illustration. The mechanism is very similar to that of a pneumatic bell in which the movement set in action by the bellows is replaced by a vertical rod which carries a weight at its lower end. When the small bellows are distended by pressing the pneumatic push shown at the right, the circuit is closed.

A small valve in the bellows allows the air to re-enter the push at but a certain rate, so that the electric contact can be maintained for a few seconds or for a few minutes as desired, by regulating the valve or by the extent of the pressure brought upon the pneumatic push-button.

The Goolden and Trotter Dynamo and "Knock-Over" Switch.

It is not often that three independent individuals hit upon the same idea almost simultaneously. A new type of dynamo, so far as the arrangement of the magnets is concerned, has been introduced by Messrs. Goolden and Trotter, a very similar pattern having been recently produced by Mr. Kapp, and it appears, says the London *Electrical Review*, that an American inventor is working on the same lines.

The dynamo shown in Fig. 1 may be described as having an Edison field in which the yoke as well as the side bars are wound. A number of these dynamos have been mounted with Messrs. Heenan and Froude's Tower spherical engine for use on the sea-going torpedo boats, the combination being probably the smallest for its weight, speed and out-put that has ever been produced.

The dimensions over all are: Height, 2 feet 3 inches; length, 3 feet 6 inches; width, 1 foot, 6 inches; weight,

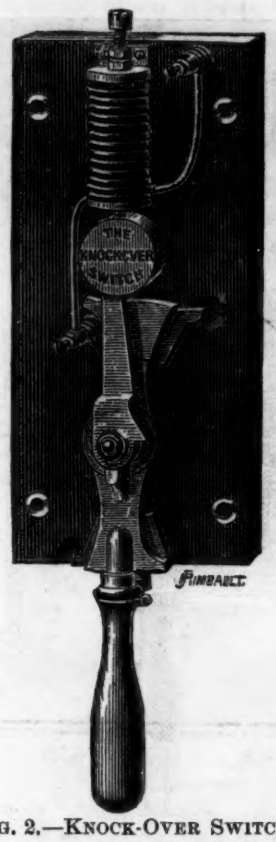


FIG. 2.—KNOCK-OVER SWITCH.

with bed-plate, lubricators, etc., 8 cwt. The output is 60 ampères, 60 volts, at 650 revolutions and at 90 lbs. steam. The engine and dynamo are easily able to produce 4,000 watts at 700 revolutions.

An ingenious switch shown in Fig. 2 has also been recently designed by Messrs. Goolden & Trotter. It is an ordinary double-break switch, provided with a device for automatically breaking the circuit when the current or the volts exceed a certain fixed quantity. The switch is fitted with an ordinary handle, and has large solid contact surfaces and sparking pieces.

The breaking of the circuit is effected automatically by a "knock-over," which consists of a weight at the end of a lever, pivotted upon the axis of the switch. The centre of gravity of the weight is nearly over the axis, having a slight tendency to fall, and it is held in this position by a catch at the end of the core of a solenoid. The strain on the catch is very small. There is a projection on the lever which meets with a stop on the switch after the weight has descended through about a right angle. During its fall, it acquires considerable momentum, and comes into collision with the switch with more than sufficient force to knock it over. The solenoid can be wound for high or low resistance; and can be adjusted for any required volts or ampères, either by a spring or by weights.

By regular use as an ordinary switch, freedom of action is insured. When the switch is "off" under ordinary circumstances, the "knock-over" is still retained by the catch, so that it can be seen at a glance whether the current has been broken automatically or as a cut-out. We have examined this switch, says our contemporary, and find that its action is satisfactory; but an appreciable period elapses during the fall of the weight.

Is the Gray Caveat Reinstated?

The following special dispatch comes from Washington under date of August 14, in regard to the Gray caveat: "Simultaneously with a meeting of the stockholders of the Pan-Electric Telephone Company, which has been held here to-day and to-night, the report is being industriously circulated that the old caveat of Prof. Gray has been reinstated at the Patent Office. One of the prominent officers of the company is the authority for the report, and he declares that the caveat will be considered and treated by the Commissioner of Patents as if no patent had ever been issued to Prof. Bell. When Commissioner Montgomery was asked as to the truth of this story, he declined either to deny or confirm it, on the ground that he would have no right to talk about the filing of applications for patents and caveats. The Pan-Electric people declare that the Gray caveat was reinstated some time ago, and that they have good reason to hope for a favorable decision, the result of which would be to give Prof. Gray a telephone patent antedating that of Bell. Dispatches received here to-night show that the circulation of this report has affected the stock market in Boston and elsewhere to a considerable extent. The Bell people here say that the report was started to accomplish just that thing in the market, and they profess to disbelieve its truth. They are more interested in the announcement made to-day that ex-Solicitor-General Goode has been engaged as one of the special counsel for the Government in the suit to test the validity of the Bell patent. They realize that the knowledge of the telephone cases gained by Mr. Goode while preparing the Government suit, will make him a formidable antagonist in the courts." The Gray caveat was published in full, with the drawings, in THE ELECTRICAL WORLD a few weeks ago.

In regard to the above, another dispatch of Aug. 14 from Washington says: "The statement that Prof. Elisha Gray's application for a telephone patent, abandoned by him when Bell was granted his patent, has been reinstated by the Commissioner of Patents, emanates from Casey Young, of the Pan-Electric Telephone Company, who claims to be counsel for Gray. According to Young, the application of Gray was reinstated three months ago. If this is true, it must have been passed upon by this time, because, in the ordinary routine of the Patent Office, an application is disposed of within 90 days from the date it is filed. If Young's statement is true, it is, therefore, possible that a patent has been granted Gray. But this would not be probable except upon the theory advanced to-night that the Bell Telephone Company has effected arrangements with Gray and with the Pan-Electric and other competing telephone companies under which it will share in the benefits of any patent now granted to Gray. It will be readily seen that if such an arrangement has been made no opposition would be offered by the Bell Company to either the reinstatement of the Gray application or the granting of a patent to Gray under it, because the Bell Company would enjoy an extension of its privileges for the life of the Gray patent. But this theory and all other theories, including that of the Pan-Electric people, that the reinstatement of the application of itself indicated that the patent would be granted to Gray on the ground of priority, and that, in any event, it will help the Pan-Electric in the suit against the Bell company, rest on the assumed truthfulness of Casey Young's statement. This is substantially as follows: Gray abandoned his application when Bell was granted his patent, on the supposition that the proceedings were honest throughout. When he discovered through the Wilbur affidavits, etc., last fall that there was doubt on this point, he filed a petition in the Patent Office to have his application, which had been dropped from the records of the patent office under one of its rules, reinstated. Three months ago it was reinstated. Casey Young claims to know all about it, because he says he acted as Gray's counsel in the matter. The Commissioner of Patents, who leaves to-morrow for Deer Park to escape the hay fever which annually seizes him, said to-day, when asked about the matter, "The filing of applications

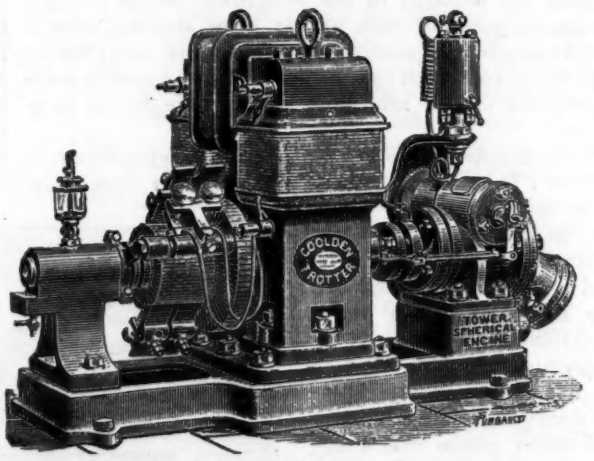


FIG. 1.—GOOLDEN-TROTTER DYNAMO.

for patents and of caveats in this office belongs to the secret archives, and I would have no right to divulge anything that may be recorded in this way. I can say, however, that I have heard nothing of any application or caveat of Gray for several months past." One thing is certain, the executive committee of the Pan-Electric Company held a meeting here to-day at Casey Young's rooms, and seemed in much better spirits than they have been at any time during the past year. This is really the only fact in the matter. Every other point rests on Casey Young's unsupported statement."

Prof. Gray denies flatly that he has been negotiating with the American Bell Company, which is represented as anxious thus to secure an extension of its monopoly for at least ten years.

The Telephone of 1664.

And as glasses have highly promoted our seeing, so it is not improbable but that there may be found many mechanical inventors to improve our other senses, of hearing, smelling, tasting, touching. It is not impossible to hear a whisper a furlong's distance, it having been already done; and perhaps the nature of the thing would not make it more impossible, though that furlong should be ten times multiplied. And though some famous authors have affirmed it impossible to hear through the thinnest plate of Muscovy glass, yet I know a way by which it is easy enough to hear one speak through a wall a yard thick. It has not yet been thoroughly examined how far Otocousticons may be improved, nor what other ways there

may be of quickening our hearing, or conveying sound through other bodies than the air, for that is not the only medium. I can assure the reader that I have, by the help of a distended wire, propagated the sound to a very considerable distance in an instant, or with as seemingly quick a motion as that of light, at least, incomparably swifter than that, which at the same time was propagated through the air, and this not only in a straight line, or direct, but in one bended in many angles.—*From works of Robert Hooke, published in* 1664.

The Working of Uninsulated Lines by Means of Potential Plates and Military Telegraphs.

BY W. E. IRISH.

(Continued.)

Something to replace the chemical batteries now in use is sadly needed in the field for military operations, and Captain Cardew scores a point on this head by being able to work his instruments with less battery power.

In the early part of 1879 I submitted to the authorities at the School of Military Engineering, Chatham, a step-by-step motion alphabetical printing and indicating telegraph instrument and three telephones. One of the telephones was Hickley's pattern, unaltered excepting in the key and connections. The second was of the same pattern and make, but the diaphragm was buckled to cause it to act as a snapper-sounder. The third was of my own pattern, in which a spring supported the bobbin and magnet between a rather thick diaphragm and a back stud. The beat against the diaphragm and the beat against the stud were very distinct from each other in tone, making a good sounder which could be worked with little power. Each telephone was fitted with a Morse key operated by a press-button which projected outside the case so as to be conveniently manipulated while holding the telephone to the ear.

I must admit that I then, as now, question the value of the telephone in the field, as during engagements, when a commander might find the telegraph of the greatest service, the noise and confusion would make the telephone worthless. It is only at intervals that the commander's voice can be heard above the general din. How, then, can one expect a telephone to be of service? From experiments by myself in the confusion of noises during several sham fights, where ordinary quiet reigned in comparison with actual warfare, I have satisfied myself that telephones anywhere in the neighborhood of a battle are worse than useless. Good sounders are far superior to any telephone, but the only instrument that can be said to be reliable and able to cope with the various requirements of the field is a recorder. The telephone has been specially recommended for outpost duty, but if I were the vedette and had the option, I would prefer to transmit my information otherwise than by word of mouth, particularly if near the enemy's lines! Mistakes and misunderstandings are at all times rife enough between one department and another, and I fear the employment of the telephone would tend but little to reduce them. Recorders can generally be read by the aid either of the ear or eye, or both, and give a record which cannot be questioned; they will get through quite as much work in the same time and with greater certainty. Who would be responsible for a serious error occuring through the misunderstanding of a message sent by telephone? Where is the subordinate commander who would care to execute a hurried order received by telephone to make a sudden movement contrary to his own convictions? The telegraph instrument required for military purposes is one that can be relied on by a commander quite as well in the midst of battle as in the quiet after a crushing victory or in an outpost camp.

Orders given during battle, if not at other times, are too important to be trusted to the memory and faulty sense of hearing of any individual, however expert and trustworthy, particularly as every one under such circumstances becomes more or less deafened, dazed and excited by the booming of cannon, rattling of musketry, clanking of armor and the many other noises incidental to a hot fight. The misunderstanding of orders so as to convey the direct opposite meaning to that which it was intended to convey at such a time, is easily possible with the most perfect telephone known, unless it also gives some record. The possibility of any such mistake occuring at such a time should be carefully guarded against, and this can only be done by recording the messages.

Only one description of instrument or system should be employed in any army; the use of a variety of instruments and systems leads to endless confusion, and they cannot be made to work satisfactorily together. An instrument for military use should be, as far as possible, reliable under all circumstances, have no delicate parts, be simple in its construction and working, silent in its operation when necessary, light and portable, and approximately complete in itself. Above all, however, it should be able to record distinctly, and with a minimum chance of error.

With these points before me, I designed a printing telegraph apparatus and the systems described later on. But any good alphabetical type-printing and letter indicating telegraph instrument possesses many advantages over sounders and telephones, and, some authorities believe, over a Morse recorder, in the field. The printing instrument of my design can be operated without any special training or previous knowledge. It can be read from the needle which indicates the letters, or from the record which is printed in type characters on a paper ribbon. The speed of working simply depends on the rate at which the lettered keys can be operated. Lines upon which such instruments are worked would, if tapped by an enemy, give no information, as the signals under all circumstances would be unintelligible to them, even if they possessed the same make of instrument, since the instruments are started from the last letter of the last message, which can only be known to those rightfully connected in the circuit. The instrument acts independently of clockwork and will receive messages during the absence of an attendant. To

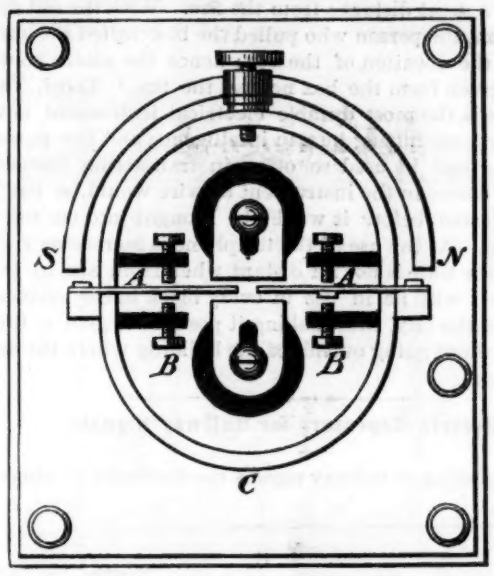


FIG. 2.—IRISH'S RELAY FOR FIELD TELEGRAPHY.

transmit a message from this machine, it is only necessary to move a switch, when the type-wheels and indicators of the instruments in circuit will rapidly and synchronously revolve until arrested by the pressing of a lettered key at the transmitting station. The depression of the key not only arrests the type-wheels and indicators, but it closes a local circuit in the receiver, causing the letter corresponding with the key depressed to be printed and the paper forwarded the distance of a blank space ready to receive another impression. On releasing the key, the type-wheels continue to revolve until again arrested by depressing another key.

I have also adapted my system of potential plates (ELECTRICAL WORLD, Aug. 14) to a system of field telegraphs, and have devised a relay to be used in connection therewith. Fig. 2 shows the instrument, and Fig. 3 is a diagram of the method of connection and operation.

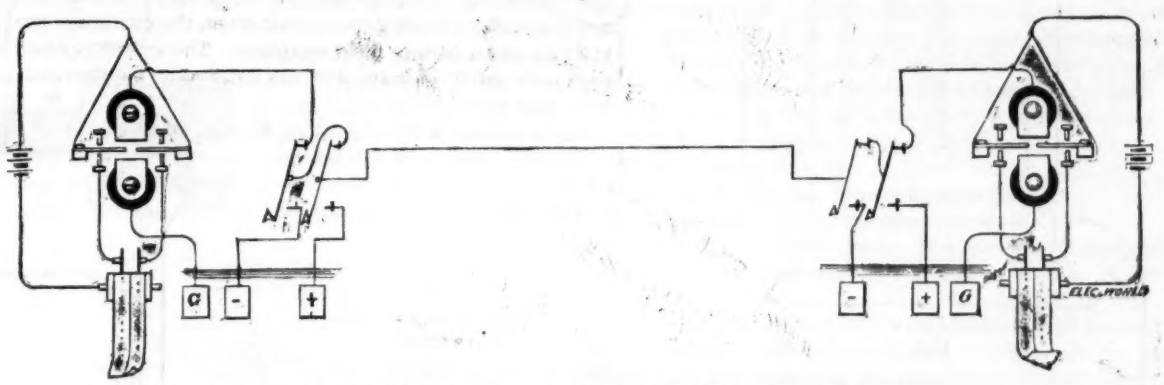


FIG. 3.—DIAGRAM OF CONNECTIONS AND CIRCUIT.

A u t o m a t i c S i g n a l s
. .. .
. . . .

A u t o m a t i c
.— ..— — . . —— .— — .. .. .

S i g n a l s
... .. —.— — .— .— —— ...

FIGS. 4 AND 5.—CODE OF SIGNALING.

In Fig. 2, *N S* is a curved magnet, adjustable by the upper screw and placed outside of a containing case of brass *C*. *A A* are soft iron tongues, having platinum contacts where they touch the screws *B B*, and they are lightly pivoted at the ends of the magnets *N S*, and polarized by it. The pole-pieces are adjustable on the electro-magnets, and they and the contact screws are arranged so as to allow both tongues to be attracted upward when no current is passing. A negative current will cause one tongue to be attracted against one of the contact screws *B*, closing the circuit through the corresponding printing stylus, as shown in Fig. 3, and marking a dot on the paper. A positive current received through the coils will cause the other tongue to be attracted against the other contact screw, closing the local circuit through the other stylus, which also makes a dot upon the paper, but on its other edge. The halves of the paper are differently tinted, so that the dot representing the dash may easily be recognized. The long and short symbols can also be recorded, both systems being shown below, Figs. 4 and 5.

(TO BE CONTINUED.)

In Mr. Irish's article describing his method of working telegraphically by means of potential plates, the diagram Fig. 1 shows the ordinary reversing key connected to the potential plates. This is an error, the connections being made as shown in Fig. 3, this page.

Telephonic Fire Alarms.

The manner in which the telephone can be utilized for fire alarm purposes is well illustrated by the results at Kansas City. The methods employed were made the subject of a special report by General Superintendent W. Wiley Smith, of the Missouri & Kansas Telephone Company, not long since. It appears that all the engine houses, the chief and assistant chief's residence, police station and the central office of the telephone exchange are connected with each other by a continuous wire (metallic circuit) of No. 12 gauge, and well insulated throughout. This wire is kept separate its whole length from the other circuits of the company's system by being strung on brackets attached to the poles just beneath the lowest cross-arm, thus reducing to the lowest minimum the chances of interruption from crossing or fouling with subscribers' wires. All connections made in the line wire are first carefully soldered and then covered with kerite tape for the purpose of insuring conductivity and insulation. In leading this wire into the different stations, wherever it enters through brick walls or wooden casings it is further protected and insulated by being passed through window tubing. Every precaution has been taken, not only in the selection of the material, but in the construction and equipment of this wire, to make it as thoroughly reliable and perfect as possible. In the matter of instruments, they have been selected and specially prepared for this service. The connections and terminals of the hand telephones and transmitters have been brightened and re-soldered. The bells used are all new and of the latest pattern. The ringer-coils of these are connected in multiple arc, thus taking away three-fourths of the instrument resistance and reducing very materially the bad effects of the extra current set up where so many magnets are in one circuit. The switch connected with the hook upon which the telephone hangs is arranged as a shunt, both ways, so that the circuit can never be left open by this part failing to act. To guard against that fruitful source of trouble, broken cords, all the instruments on this circuit are provided with double cords soldered together at their terminals, and so secured that the strain or weight of the instrument cannot affect the conductor.

There are, in all, twelve sets of instruments and about six miles of wire on this circuit, but no difficulty is experienced in either signaling or talking between the different engine-houses and stations. The set of instruments at the central office of the exchange is not connected in any manner with the rest of the exchange instruments or other apparatus of the company's system, and cannot under any circumstance be used for any other purpose than the fire alarm service.

The modus operandi of receiving a fire call from the exchange system and repeating it over the fire alarm system is substantially as follows: The person reporting the fire first calls up "Central," and as soon as the operator on that board understands that it is a fire notice, she tells him to wait a moment while she puts him in connection with the monitor or chief operator's desk. She is then through with him, and attends to her other duties. The different operators on the boards are not allowed to receive a fire notice themselves. They simply connect the subscriber giving it with the monitor, where the chief operator or his assistant is always on duty to receive it. On each table there is a central spring-jack (used for this purpose only) connected with the chief operator's desk and to a 6-inch vibrating gong, placed in a conspicuous position on the wall. When the switch-board operator receives the call, she inserts the corresponding plug of the pair of cords with which she answered the subscriber into this central spring-jack. The mere act of doing this connects the subscriber with the chief operator's desk and rings the gong at the same time, thus giving notice of a fire to every operator in the room.

The chief operator springs to his desk and instruments and takes from the subscriber, as far as it is possible to do this in so short a time, the exact location, nature and progress of the fire. He then turns to the fire alarm instrument and gives one prolonged ring. This is heard on every instrument on the circuit, and brings every man on the force to his post. While the horses are being hitched, one man, detailed for this purpose at each station, receives the call. The chief operator repeats slowly and distinctly, two or three times, the exact location, and it is taken simultaneously at each station by the listening man. By the time the horses are on the move, he is in possession of all necessary information and ready to take his place. Sitting in his office on the same floor as the central exchange, Mr. Smith always hears the ring of the alarm gong in the operating room whenever a fire call is received. He can also hear the fire department bell in the tower of No. 2 engine house, which is started the moment the department receives the call and location of the fire. Mr. Smith has frequently timed the period between the ringing of the gong in the operating room, which is the first notice the exchange has of the fire, and the ringing of the department bell, which means that the force have received the call and are on their way to the scene of the fire; and he has invariably found all this accomplished within the limited time of forty seconds.

There are over 1,400 telephone instruments in Kansas City. There is scarcely a block within the city limits but has at least one or two telephones. Access can be had to these with little trouble at any time of the day or night, the telephone force being on duty all night. If the alarm is sent in by an intelligent person understanding the service and the value of reliable information, the department receives the exact location of the fire, even to the number and particular floor of the building, and can thus drive at once to the nearest plug for water service. Immediately after giving the notice to the fire department, the chief operator rings up the water department and notifies them to put on fire pressure. He also enters in a memorandum book, kept for that purpose, the day and hour and the number of the particular telephone from which the call was sent in. Mr. Smith states that he has often, in the course of conversation with his subscribers, received very flattering commendations of the system and service as above detailed. Through the aid of the telephone system, the subscribers can find out at once the location and extent of each fire. So much is this depended on, that the moment the department bell begins ringing, fully three-fourths of the subscribers call up, asking the location of the fire. When a man is wakened up in the middle of the night by the "twanging and the clanging of the bells," there is much satisfaction for him in finding out by simply stepping, even in the airiest attire, to his telephone that his store or factory is not in danger, and that he can go to bed again. Mr. Smith believes that the fire service of Kansas City is one of the best and quickest in the country; and second only to the administrative ability of its executive and the faithfulness of the combined force, may be mentioned the efficiency and promptness of its telephone alarm service.

Chief Hale, of the Fire Department, says, over his own signature: "I desire to express my opinion of the telephone as a means of transmitting fire alarms. This city has depended wholly upon the telephone as a fire alarm for the past six years, and I am pleased to state that it has proven to be a grand success, as well as that the small losses by fire in this city are due in a great measure to the prompt and accurate alarms received by the department through the telephone exchange. I hold that the transmission of speech is as far superior to mechanical signals as the express train of to-day is superior to the ox-cart of old as a means of encompasing space. Some of the many advantages of the telephone over all other systems are as follows: First. The number of the building, and the name of the firm or occupant, may be given with the alarm, thereby giving the companies responding to the alarm an opportunity of locating the hydrant which they are to use. Second. A person may be at Second and Main streets, and may be the first to see an unusual light reflecting over buildings located at Twenty-fifth and Main street.

"Now, by the use of the telephone, the fire department may be notified by calling 'Central office' and giving the location of the fire; thereby any person may give an alarm at a great distance from the fire. With the old signal system, the person who pulled the box called the firemen to the location of the box; hence the alarm could only be given from the box nearest the fire. Third. The telephone is the most durable electrical instrument now in use for transmitting human intelligence and the power of speech, and is used so often in transacting business that any defect in the instrument or wire would be liable to be detected before it would be brought into use for a fire alarm. As the use of the telephone is increasing very rapidly, the time is not far distant when from six to ten telephones will be in use in every block in the business portion of the city, thus making it possible to give a fire-alarm without going outside of the building where the fire originates."

Electric Repeaters for Railway Signals.

The repeating of railway signals mechanically is almost as old as the signals themselves; but as difficulties were experienced due to distance, electric repeaters were introduced and used for such signals only as were invisible from the signal box, so that up to a certain date few electric repeaters were brought into use.

Quite a number of various types have been designed acting both by gravity and current, and with single and double circuit and one or more batteries. With the object of simplifying the problem, Mr. J. W. Fletcher, chief telegraph superintendent, engineer of the London & North western Railway, has devised a system in which, by the use of one wire and one battery he shows signal "ON," "OFF" or "WRONG," and by the same wire bringing into play two additional cells, shows light "IN" or "OUT." Some inventors, says the *Mechanical World*, urge that there is a disadvantage in using a separate battery for ON and another for OFF, inasmuch that while one battery is at work the other is at rest, recruiting itself; the inventor of the one battery scheme meets this by saying that it is not a matter of opinion but a matter of fact that one battery is decidedly the best, and for the simple reason that where one battery is used a fault cannot be remedied except by a new or refreshed battery; where two batteries are used the ON or the OFF battery only may fail, and the signalman begins to regulate his signal wire, not knowing that it is a battery failure, but when one battery is used and his repeater shows "*wrong*" no regulating of the signal will move the indicator from the "*wrong*" position, and the signalman knows that it is an electrical and not a mechanical defect. Figs. 1, 2, 3, 4 represent the repeater in signal box, contact box, or pole changer, expansion tube and battery at signal post respectively; in Fig. 1 *E* is the arm indicating the position of the signal-arm *F*, the disc working in connection with the arm *E*, showing when signal is wrong, *D* the disc showing when light is IN or OUT. In Fig. 2 the outer springs are the earth connection marked *H*, the two inner are the battery springs, and the stud at the top will be seen to be the line connection; the lever *Z* places either the positive pole to "earth" and the negative to "line," or *vice versâ*. The position shown is that in which the springs are all disconnected and the arm *E* shows signal *wrong*. In Fig. 3 the piece *A* is moved by the expansion of tube *T*, and has small insulating pieces at each end on which either the spring S^2 or S^1 rests; the current passes by means of the springs S^1 or S^2 through the piece *A* to the springs *S* and S^4, and thence to the contact box. In the normal position of *A*, that is to say "light out," the current passes by means of S^1 through *A* and S^3 and S^4 to the contact box; thus it will be seen that only half the battery is used to repeat the position of the arm, S^2 resting on the insulating piece; when the light is in *A* is moved by the expansion of *T*, and the spring S^1 passing on to the insulating piece immediately after S^2 comes on the metal part of *A*, thus placing the whole battery in circuit and indicating "*light in*."

Fig. 5 represents the "repeater," in which the coils *A* actuate the arm *E* and disc *F*, and coil *B* the armature *C* and its attachment C^1, which in turn raises the disc *D*; it will be seen that the coils *B* are joined one each side of the coils *A A*.

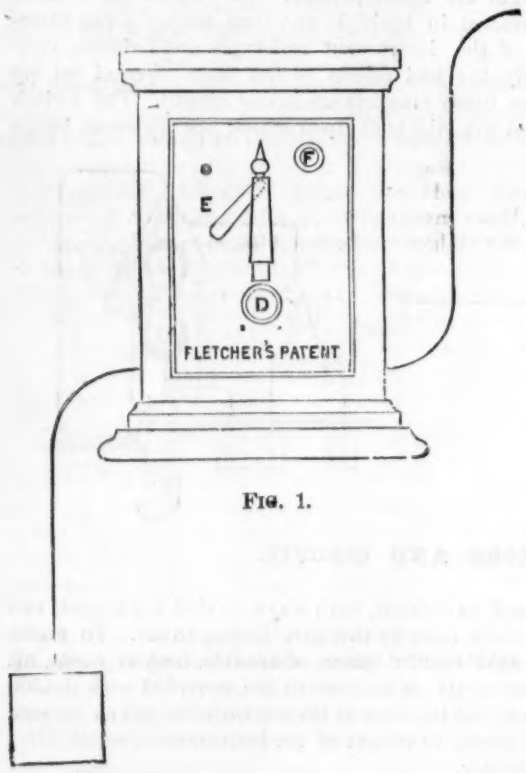


FIG. 1.

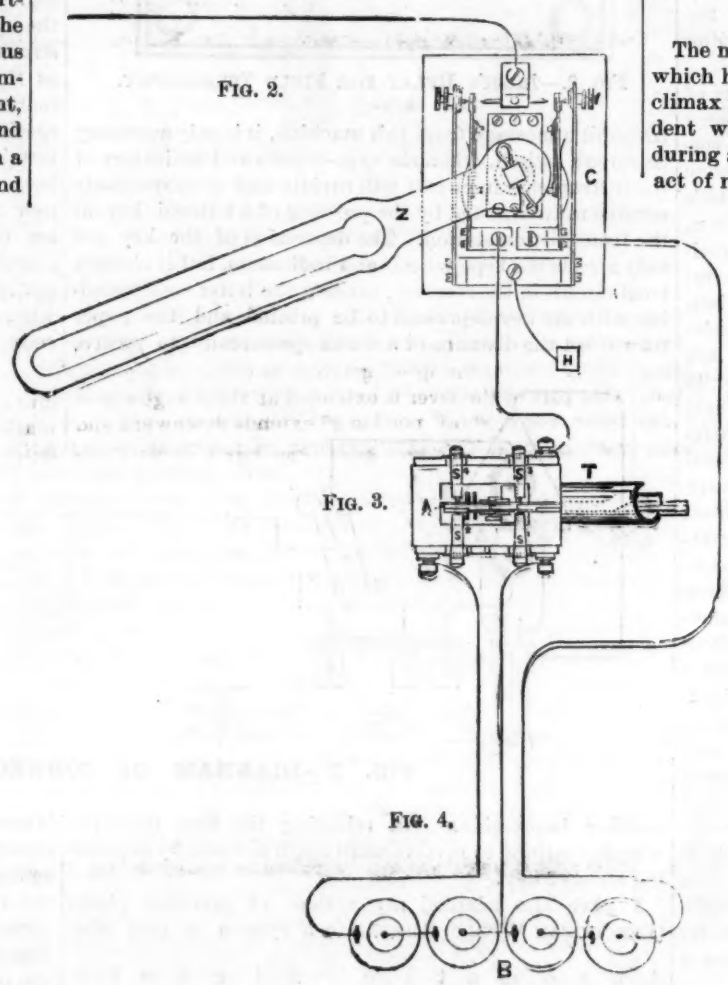


FIG. 2.

FIG. 3.

FIG. 4.

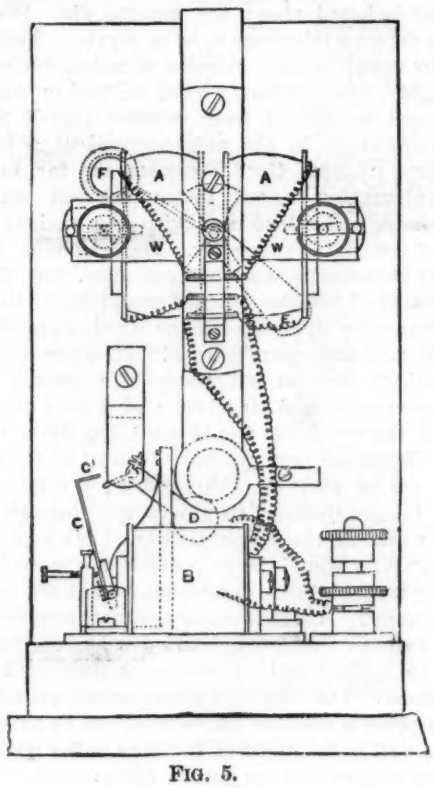


FIG. 5.

FIGS. 1, 2, 3, 4 AND 5.—REPEATER FOR RAILWAY SIGNALS.

A Curious Effect of Lightning.

The many remarkable stories of the action of lightning which have been reported this year have just reached a climax in an apparently trustworthy account of an incident which occurred at Plainfield, N. J. It seems that during a heavy thunderstorm a young lady, while in the act of removing a polished ornamental tray from a table in a dark room, was suddenly blinded by a vivid flash of lightning, and on examining the plate the following day was surprised to find a distinct outline of her features marked upon it. It was to all intents and purposes a case of photography without a camera, such as we have already described in our columns. Mr. Leo Daft, of Plainfield, the well-known electrician, who, by the way, is an able photographer, too, has examined the tray, and now proposes to try some experiments with electricity upon a similar tray, to determine, if possible, by just what chemical action this curious effect has been produced. The tray is of tin, about fourteen inches in diameter, and is stamped in imitation of alligator hide. It is heavily lacquered to resemble brass, and it has a high polish. The lady's profile appears in an entire change in the surface of the yellow lacquer. In color it is a light buff, and it is without the gloss which covers the other parts of the tray. The edges of this discolored surface are softly but distinctly outlined, especially along the lines of the wavy hair and about the shoulders. A curious feature of the picture is the fact that where the lady's eye would naturally be placed in a portrait the lacquer is untouched by the lightning's flash.

Mr. Daft is of the opinion that the picture was produced by oxidization under the intense electric light. The lacquer on the tray undoubtedly contains among its ingredients bichromate of potassium, sometimes called dragon's blood, upon which the intense light may have had its effect. He holds, in fact, that the picture was printed by light, and that the flash was reflected from the face to the inside of

the opposite window pane, and thence thrown upon the tray, producing an actinic portrait. Such a change in the appearance of the lacquer, containing in its coloring matter ingredients sensitive to light, might take place in the course of a long time over the whole surface of the tray from the effect of a diffused light, and this curious flash of Jersey lightning has, according to this theory, simply done in a fraction of a second, by a brillant effort directed to a small spot on the tray, what the rays of the sun would have taken months to accomplish over the whole surface.

A Mammoth Dynamo.

The first of the large dynamos which will be employed in the electric smelting operations of the Cowles Electric Smelting and Aluminium Company, at Lockport, N. Y., has been put into place in the company's works, and will soon be started up in regular operation.

The dynamo was designed by Mr. C. F. Brush, and the following figures will give an idea of its size and power:

	Pounds.
Armature	4,300
Eight Magnets	9,295
Rails	800
Chair (pulley)	2,300
Chair (front)	2,050
Wrenches	26
Segments	15½
Oil cups	10½
Pulley key	6
Brushes	6
Connection board	22⅔
Shunt cables	5
Brush clamps	37
Brush rockers	69
Brush lever	18
Pole pieces	67½
Pole piece stands	18
Chair braces	148¼
Bolts	252
Pulley cap	526
Chair blocks	293
Commutator box	527
Rocker stands	379
Pulley	500
Total	21,671½

Or 10 tons, 1,671½ lbs.

The dynamo will be driven at a speed of 410 revolutions, giving a current of 3,000 ampères of 83 volts electro-motive force in the external circuit. The amount of current in the field is 80 ampères, which alone would be considered a good external current from an ordinary-sized lighting machine; 355 horse-power is required to produce this result. The machine will be set in motion as soon as the final connections are made on the two 30-inch Victor turbines that are to drive it.

The Henry Electric Locomotive.

Among the workers in the field of electric railroading is Mr. John C. Henry, of Kansas City, who has been busy for some time past in elaborating a system which possesses several novelties worthy of notice. Without entering into the various methods employed by Mr. Henry in distributing and taking off the current from the conductor, either overhead or underground, we come to the locomotive car itself and its arrangement. This is shown in Figs. 1 and 2, which represent respectively a transverse sectional view and a plan of the car.

The principal objects aimed at in the present construction are to make each motor automatically adapt itself to every change in load and grade, and to afford safety devices by which no injurious effect could be produced through abnormal conditions of working. Mr. Henry has also adopted an arrangement by which the motor is kept at a constant uniform speed, irrespective of the speed of the car.

As will be seen by the accompanying illustrations, the motor is mounted on a frame *D*, which permits a direct connection to be made with the axle from the driving-shaft of the motor *E*. For the purpose of automatically controlling the supply of the current to the motors, the driving-shaft *G* of the motor is connected by the bevel gear *i* with the upright shaft *k*, carrying the governor *K*. A sleeve *P*, on the shaft *k*, is attached to the governor at one end, and from the sleeve there extends an arm *m*, carrying the rack *M*, which gears with the pinion *N*. Encircling the latter is a series of resistance coils *O* in electrical connection with the main conductors through brush *n'* and lever *n* and branch conductors. When from any cause the speed of the motor shaft varies from the prescribed limit, the rack *N* is drawn up or down by the governor *K*, which moves the contact-brush *n'* over the commutator of the resistance coils, increasing or decreasing the resistance to the current.

For the purpose of automatically reversing the poles of the motor, the two opposite poles of the switch *T* are connected to wires running to the motor-field and to the commutator-brush *e*. A segment rack-lever s^2 gears with the pinion of the switch, and a spring s^3, attached to the lever, keeps the rack in one position under tension. The opposite end of the lever s^2 is provided with the armature *s'*, and in the field of the electro-magnets *s*. Two short circuits extend from branch conductors in electrical connection with the magnets *s*. A circuit-closer s^6 is also provided, the key of which is held in a horizontal position by means of a spring s^5. The electro-magnet *s* is also connected to the circuit closer. With this arrangement, should the shaft of the motor attain a rate of speed above that necessary to propel the car, the governor is thrown out, thereby drawing down the sleeve *P*, and the projection *P'* depresses the key of the circuit-closer s^6, the magnets *s* become excited and draw down armature *s'* on lever s^2. This rotates the pole-changer *T*, which changes the polarity of the motor and allows it to generate instead of drawing upon the current. When the poles of the motor are reversed and the motor is acting as a generator, the current is shunted from the resistance coils through a leak-circuit, the circuit being made through the circuit-closer s^6. The speed of the motor is indicated by means of the needle *l* on the indicator *L'*.

The driving shaft *G* of the motor is provided with an intermediate friction-clutch *H*, placed in connection between the motor *E* and gear J^2. One portion of the clutch *H* is provided with a neck *g'*, in which the end of

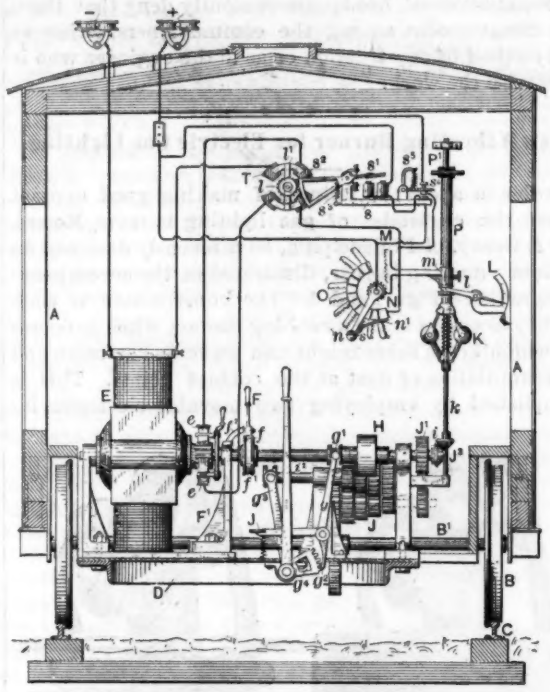


FIG. 1.—HENRY ELECTRIC MOTOR.

lever *g* of the interlocking device is held by pins q^6. The lever *g* extends from the shaft *G* to the lower part of the supporting base to the speed gearing, to which it is pivoted. One part of the lever is extended at right angles as a foot lever, and a short portion g^3 extends downward and is tapered at right angles, so as to engage with the gear-sector g^4, which is pivoted to the frame *D*. A hand-lever extends vertically from the gear-sector g^4, to which it is attached, and a lever g^5 is attached to the same point, and also in rigid connection with the hand-lever, and is connected with the end of the reciprocating plunger i^2,

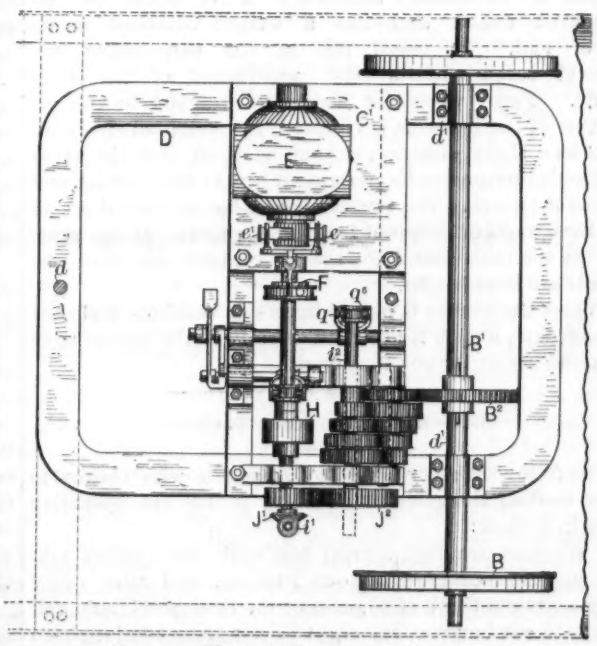


FIG. 2.—HENRY ELECTRIC MOTOR.

which is reciprocated in the direction of the speed-gearing and for engaging the gear. Thus when it becomes necessary to change the speed of the car or change the relation of the gear without checking the speed of the motor-shaft, the foot lever is operated to throw the friction-clutch *H* apart. This releases the end g^3 of lever *g* from the sector-gear g^4 and the hand lever is then operated to throw the plunger in or out of connection with the various gears. The gear *J'* on the shaft meshes with gear J^3, and the gear J^2 is mounted upon the same shaft i^2 as the speed-gearing, which in turn communicates power to the gear B^2, attached to the axle *B'*.

While all these arrangements are by their nature designed to be more or less automatic, Mr. Henry has also introduced devices for reducing the rate of speed when required by means of the ribbon brake *F*. It is further evident that the contact-brush of the resistance coils may also be moved by hand for starting, checking or reversing the motor.

Prizes for Electric Motors.

In view of the great interest now felt in the subject of electric motors, our English contemporary *Industries* has offered a "reward" of one hundred guineas, about $500, for the best electric motor. It says: "Great and rapid as has been the progress in the application of electricity for lighting purposes, its application as an agent for transmitting and converting power has hitherto not received sufficient attention. Yet this branch of electrical engineering might, if properly developed, become an industry of even greater importance than that of electric lighting, and thus afford profitable employment to a large number of workers and to a considerable amount of capital." The terms of competition given below appear to be very carefully designed to secure absolute fairness, and will be found commented on editorially on another page:

PARTICULARS OF THE REWARD.

1. An award of 100 guineas will be paid to the person who, being the original inventor, sends us the best design of motor complying generally with the conditions stated below,

2. If the person to whom the award is adjudicated desires it, the proprietors will take out an English patent for him free of cost.

3. If the person to whom the award is adjudicated desires it, the proprietors will have a model of his motor constructed, free of cost, and present it to the inventor.

4. The person to whom the award is adjudicated shall remain absolute proprietor of his invention, patent, and model.

CONDITIONS OF COMPETITION.

1. Any person, not being a member of the staff of this journal, is entitled to compete.

2. Persons competing must send to the editors, on or before the 31st December, 1886, a complete set of working drawings of their motor. The design must be for a motor of 10 h. p. actual. The drawings must be accompanied by a complete specification, setting forth the principle and details of construction, the weights and quantities to be used in the construction, horse-power, speed, efficiency, current, and electric pressure.

3. To insure secrecy of names, the drawings and descriptions must not be signed with the name of the competitor, but must bear an assumed name, motto, device or other distinguishing mark.

4. A second sealed envelope containing the real name and address of the competitor must accompany each communication, and bear outside the same distinguishing mark. These envelopes will not be opened until the decision of the judges has been published in this journal.

5. The award will be adjudicated by a jury composed of the following members:

W. H. PREECE, F. R. S.;

Professor G. FORBES, M. A., F. R. S. E.;

Professor GRYLLS ADAMS, M. A., F. R. S.;

and the Editors of *Industries*. The jury shall have power to call in other professional assistance, if they deem it necessary.

6. The designs submitted for competition will be treated as confidential communications, and will only be published with the consent of the respective competitors, the only exception being the design of the successful motor, which will be published as soon as its English patent has been secured.

7. The person to whom the award is given must enter into an undertaking to work his invention in England for at least one year before working it abroad. By the word "working" is meant the manufacture of the motor by the inventor himself or by others under his license.

The Motors Must Fulfill the Following Conditions.

1. *General Construction.*—The motor must be a self-contained machine, requiring no special bed plate or foundation. It must be of compact and strong design, occupying little space, and be able to do the work for which it is intended, without danger of breakdown, undue wear, or other inconvenience. It must be able to stand a momentary excess of load, such as is sometimes unavoidable in rough practical work. It must be able to run continuously at full load in a room of ordinary temperature, without undue heating of any kind (whether from mechanical, magnetic or electrical causes), and no water or other liquid (except a moderate amount of lubricant for the working parts) must be used to keep it cool. The power must be given off from one shaft only, which is to be left long enough to receive a pulley, but the weight of this pulley need not be included in the total weight. This shaft may be that of the armature, or it may receive power from the armature by some kind of gearing. In the latter case more than one armature may be used; but the gearing must form part of the motor, and its weight must be included in the total weight. The efficiency is to be taken as the ratio of the brake horse-power given off from the shaft and the electrical horse power delivered to the terminals of the motor.

2. *Electric Pressure.*—The motor must be constructed for an electric pressure of not less than 100 and not more than 500 volts.

3. *Insulation.*—The design must admit of a perfect insulation of the electrical circuits thoroughout the motor.

4. *Weight.*—The total weight of the motor when in working condition must not exceed 950 lbs.

5. *Speed.*—The speed of the shaft where the power is taken off should not be more than 250 revolutions per minute.

6. *Efficiency.*—The commercial efficiency should not be less than 80 per cent.

Destruction of a Brush Station in New York.

A serious fire occurred on the night of the 16th inst. at the Brush station in Elizabeth street, this city. The buildings were 204, 206, 208 and 210 Elizabeth street, below Prince street and opposite No. 9 truck house. Nos. 208 and 210 were three-story and the others two-story, though used in the clear, with no floors. This was the boiler and engine room. In the three-story part were offices, shafting, machinery, lamps and stores. The boilers, engines and the forty dynamos were the costly part of the plant, which was valued in the aggregate at $200,000. The fire began on the second floor of the three-story building, and is supposed to have been caused by a shaft heated at the journal from friction. In four minutes from the time of the first alarm at 7:28 P. M. the entire three-story building was in flames. The three-story building was once a soap-factory, and was soaked with grease. A slack pressure of water hindered the work of the firemen greatly.

The lights that this plant was supplying directly were switched off before the firemen arrived. Altogether the Elizabeth street plant and the station in West Twenty-fifth street were running 1,200 lights. They served the city in Fifty-ninth, Forty-second and Fourteenth streets. Broadway, Fifth avenue and Seventh avenue, many of the private arc lights in the Bowery, and private arc lights from Fourteenth street to the Battery. The West Twenty-fifth street station was still serving 400 lights between Fifty-ninth and Fourteenth streets when the firemen got to Elizabeth street. At the outbreak of the fire the electric light company connected the eastern system with the western by a switch at the Bowery and Fifth street, but the firemen feared that in their wet clothing they would be in danger at their work with the wires alive, and orders were telephoned up to Twenty-fifth street to shut down the eastern section, and this was done. Superintendent McGrath, who was out of town, was notified of the occurrence and came in immediately. He soon put matters in shape, and by midnight nearly all the lights of the Elizabeth street station were being run by the Twenty-fifth street station. The latter station will temporarily operate the entire Brush plant. The property destroyed was insured.

Shot-Firing in Mines by Electricity.

The Accidents in Mines Commission some little time since issued a volumnious report, the result of very exhaustive inquiries and experiments made by them with a view to the prevention of the frightful explosions periodically occurring in many coal mines. They laid great stress upon the danger caused by the naked flame which must be present at the explosion of a shot, and which, coming into contact with any explosive gas that may be at hand, would be sure to ignite it. They recommend the use of certain explosives in lieu of gunpowder which, fired under stated conditions, can give off no flame. To explode these shots they name electricity in the following emphatic terms: "Electrical exploding appliances present very important advantages from the point of view of safety over any kind of fuse which has to be ignited by the application of flame to its exposed extremity, as the firing of shots by their means is not only accomplished out of contact with air, but is also under most complete control up to the moment of firing. Their simplicity and certainty of action have been much increased of late years, while their cost has been greatly reduced, and but little instruction is now needed to insure their efficient employment by persons of average intelligence."

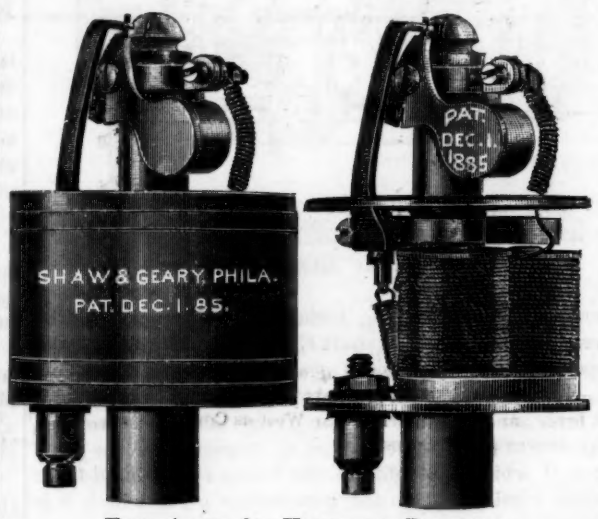
New York Subway Matters.

The State Controller has ordered an assessment on the electrical companies operating wires in this city of $80,000 to provide for the expenses of the Subway Commission. Each of the commissioners is entitled to a salary of $5,000 a year, payable quarterly, but none of them has been paid a cent. Altogether the board has spent about $22,000. The expenses of the commission are to be paid entirely by the companies operating electrical conductors in this city. Each company is assessed pro rata according to the number of miles of wires that it operates within the city limits. The commissioners have been trying to get the Controller to make an assessment for some time, but he thought best not to do so until after the contract to bury the wires had been signed by the construction company. When this was done last week he called on the companies for information respecting the number of miles of wires that they used. They are compelled by the law to furnish it. Each of the forty or more companies using electrical currents has now been informed that it was assessed at about the rate of $4 a mile, and that 25 per cent. of this assessment was due. The Metropolitan Telephone Company was put down as operating about sixty-six per cent. of all the wires used in New York and was assessed accordingly, but is understood to object to the payment of any such proportion. The matter is referred to the commission.

As to work on the subways, it was stated at the office of the commission last week, that Engineer Kearney, as well as Chemist Ledoux, who are watching the operations for the construction committee, had reported that everything was progressing satisfactorily at the construction company's works, and that as yet no evidence had presented itself that there would be delay in beginning operations on the day fixed. At the same time it was authoritatively stated that Dr. Ledoux, in order to satisfy the public, would make a public test of the material to be used for the conduit before the first stone was removed from the Sixth avenue pavement. Notwithstanding the various rumors to the contrary, the officials at the Subway commissioners' headquarters stoutly deny that there is any disagreement among the commissioners, either as to the method of construction or as to the engineer who is to supervise the work.

A New Vibrating Burner for Electric Gas Lighting.

In order to avoid the failure of making good contact between the electrodes of gas lighting burners, Messrs. Shaw & Geary, of Philadelphia, have recently designed an ingenious vibrating burner, illustrated in the accompanying engravings, Figs. 1 and 2. The construction is such that the electrodes make a rubbing contact when in operation, which keeps them bright and prevents corrosion and the accumulation of dust at the contact points. This is accomplished by employing two movable electrodes in-



FIGS. 1 AND 2.—VIBRATING BURNER.

stead of one in the usual form, as will be seen. The one which is ordinarily stationary is swiveled on an insulated collar, and has a weight attached to its lower end. A small pin in the slot below the pivotal screw limits the movement of the electrode. Thus, when the electrode attached to the armature of the magnets is vibrated, the weighted electrode follows a short distance, is then stopped, and the other electrode continuing its movement breaks the contact and forms the spark. The two electrodes being centred so as to have radii of different lengths, a rubbing takes place during the time that they are in contact, and thus the points are kept bright.

Where the burner is placed upon side brackets and low chandeliers, a push is attached directly to the burner so as to avoid use of the pendant chain.

Edison and the Cockroaches.

The following story is told by some one who claims to have worked alongside Mr. Edison in his old operating days in Boston:

"We were troubled a great deal with cockroaches taking out first mortgages on our lunches, and tried every way we could think of to prevent the little pests from getting into our boxes. One night Edison hung his lunch on the gas pipe with a long string. He settled back to work, and had just finished receiving a message when he chanced to glance at his lunch box. Two acrobatic cockroaches, which evidently had had their eye on Tom all the evening, were climbing the wall. They reached the gas pipe and stopped directly over the string. Then they took a survey of the room for a moment, winked at Tom and then commenced a series of gymnastics on the string that would have made the "Kerosene" Brothers grow green with envy. They did the giant swing, skinned the cat, hung by their heels and finally made the leap for life, landing on Tom's lunch box. They dropped down pieces of pie and ham sandwich to the less acrobatic members of the cockroach fraternity on the floor, and when all were supplied with their evening repast they both winked at Tom once more, shinned the rope, turned a somersault on the gas pipe and sneaked off to the seclusion of the nooks and crannies with which the old building abounds. Tom peered over the table at me and said, 'Just wait till to-morrow night, and if I don't paralyze every bug in this building I'll eat my old boots,' and he did, too. One of the tables was used by the boys as a place of deposit for fifteen or twenty lunch-boxes, and this was the place selected by Tom as the field of carnage. The next day was Sunday, and, as there isn't much going on Sunday evenings, we had plenty of time to see the erection of the cockroach paralyzer. Tom came around early with his pocket full of tin foil, and enough of fine wire to reach from the table to the switch. He cut and fastened the foil together in long strips about half an inch or an inch wide, and laid them around the edge of the top of the table side by side, and as near together as possible, without touching. The strips were held in place by small tacks. To each strip he connected a wire and ran them to the switch, where they were both connected with two batteries of 350 cells each. When all was ready the boys put their lunches within the cordon of tin foil and battery connection and awaited the result. The first to appear for supper were the two acrobatic roaches which did the ground and lofty tumbling act the night before. They winked at Tom and commenced shinning the leg of the table. We gathered near to watch the result, and the roaches seeing us approach stopped shinning.

"'Sh," says Tom, "give 'em a show, boys."

"We stepped back and the roaches climbed nearer and nearer to Edison's 'dead line.' The first one reached the top about five lengths ahead of his companion. He stopped on the extreme edge of the table, eyed the foil and the lunch boxes, braided his legs together and then started for the nearest lunch box. When he attempted to cross the tin-foil he made a connection and keeled over as mute as an osseous, begrimed old fossil from the dead ages. His companion was transformed into a dead cockroach before he could think what hit him, and before 10 o'clock that night the pile of dead cockroaches around that table looked like the breastworks thrown up on Bunker Hill by the fighting farmers of 1776."

The "Two Fluid" Theory of Electricity.

To the Editor of The Electrical World:

SIR: Permit me to ask the readers of THE ELECTRICAL WORLD: What is there to justify a theory that "simplifies" by the conversion of motion into an imponderable fluid, and this in the face of the doctrine of the conservation of energy?

I. Would it not be more consistent and as simple to have a "Two Motion" theory? The reasoning being this:

(*a*) One motion is the sum of two others when it produces the same change of position or transference as do the two combined.

(*b*) Two or more motions may cause a body to be at rest relatively to a second, thus: If a man walk from front to rear of a car moving on a straight road at the same rate, the man is at rest relatively to a stone on the track beneath him. If one of these motions cease, this is no longer the case, but there is a change of relative position.

(*c*) An unelectrified body is one devoid of electrical motion. An electrified body tends to come to rest by taking up the complementary motion; that is, that which added to it will give rest.

(*d*) If two bodies through their mutual action be electrically disturbed and one be prevented from uniting its motion with that of the second, thereby giving electrical rest, then the first will tend to take up this complementary motion from a neutral third body with which it has free connection, thereby causing it to have a disturbance complementary to that of the first.

Ill.: $10 = 7 + 3$. If the 7 take a 3 from a new 10, it will leave another 7 which, if free to unite with the 3, will give 10.

II. Though this is the end of a needed theory, there are certain analogies.

(*a*) All parts of the same body, or freely connected bodies, tend to have the same molecular disturbance. Heat flows from the warmer to the colder body; or, rather, the latter tends to take on the motion of the former, which thereby tends to come to rest. Two centres of electrical disturbance tend to be brought into a neutral state by a progressive disturbance or current going from the one to the other.

(*b*) If a body be passing from a state of less molecular motion to that of a greater, as from the solid to the liquid state, the application of heat, *i. e.*, communication of heat motion, does not raise the temperature, but it is taken up in the extra motion of the liquid state. The reverse takes place when passing from the liquid to the solid state. Now, a body placed in contact with this melting body tends to lose its heat motion, especially if the melting is forced, as in the case of the salt and ice of a freezing mixture. Again, if a current starts to adjust the electrical disturbances at two extremities, and there be, as before, a lack of motion, there will be a tendency to take up motion from a neutral body, and thereby will be caused an opposite induced current.

If the current be stopped, the reverse takes place.

III. Absurd as (II.) may seem, we might go further and suppose the difference of the chemical elements to simply result from different forms of disturbance of but one kind of matter which at chemical rest is hydrogen, and that in the reaction $Zn + 2HCl = 2H + ZnCl_2$, the Zn does not displace the 2H, but merely comes to rest and becomes 2H, while the 2H, taking its motion, becomes Zn.

DES MOINES UNIVERSITY. INQUIRER.

New Fields for Electricity.

A novel and original application of electricity has, says the *Mechanical World*, been evolved by an inventor, who, we need not say, hails from the land of stars and stripes. He probably is the happy husband of a woman who loves her country and contributes to its greatness by frequent additions to the number of its future presidents, and has found them troublesome during the first stages of their progress toward this final goal of every properly constituted American. So he conceived the idea of making electricity, which already lights his house, calls his helps, turns the spit and brushes his boots, further serviceable in the nursery, and has invented an electric cradle, in which electricity plays a double part. Firstly, it rocks the cradle, instead of the husband having to perform this duty at night. The cradle is hung on two swivels as usual, and carries an iron armature which is alternately attracted by two electro-magnets, with change of current at each contact. The practical value of the invention has been demonstrated by the fact that several babies enjoying the reputation of confirmed screamers have succumbed to the fascination of the electric cradle in a few minutes. No doubt the thought that so much ingenuity had been devoted to their comfort rendered them speechless or rather screamless. Secondly, two fine threads are arranged parallel to each other, and half an inch or so apart, in the material of the mattress across the cradle at the proper place, and communicate with the poles of a battery. In ordinary times no current passes, but when an event, the nature of which we need not more particularly specify, happens, the conductivity of the material separating the two wires becomes increased, the current starts and rings a bell to announce the heterogeneous current. The advantages of the new invention must be evident to every married man, and nobody, therefore, needs to be surprised that a company with a capital of a million dollars, the Electric Cradles Company, has been formed immediately at New York to work it. We venture to suggest that this is only half an invention, and wants to be completed by an electric automatic sponging, drying and linen changing apparatus, and that the nursery appliances require to be further augmented by a periodical feeding machine worked by electricity. Stomach pumps are at present chiefly used for emptying that food reservoir, but there is no reason why they should not be employed for filling it and future presidents be saved the waste of energy caused by having to suck the bottle. Until all this is done young husbands will not be able to enjoy their sleep uninterruptedly, and therefore we do not doubt that electricians will devote themselves seriously to the solution of the problems we have indicated.

Electric Light Wires for the Subways.

The American Electric Manufacturing Company was first to make application to the Commission for space in the new subway. President Goff says he has two subcompanies already organized and ready to begin lighting business in New York and Harlem, viz.: The American Illuminating Company, of New York, with a capital of $300,000, to do busine s between the Battery and Forty-second street, and the American Illuminating Company, of Harlem, with a capital of $100,000, to do business above Forty-second street and cover Harlem.

Strength of Submarine Cables.

A submarine cable, says the *Manufacturers' Gazette*, is by no means of uniform strength, the thickness depending to a large extent on the depth of water. For instance, a shore end in the shallowest water, and subjected to the greatest danger from the anchors of vessels, will be the heaviest portion, sometimes going as high as 27 tons to a knot. In forming the shore end cable, the core is covered with hemp and a double sheathing of iron wire, the inner sheathing being of 12 wires of a diameter of 0.165 inches, and the outer sheathing 14 wires, with a diameter of 0.280 inches. The outside is covered with hemp yarn and bituminous compound, the whole weighing about 16 tons per nautical mile. A portion of the intermediate cable is covered with 12 wires, 0.252 inches in diameter, weighing in all 5 tons; another portion is covered with twelve wires 0.165 inches in diameter, weighing about 3 tons. The deep sea is covered with 12 steel wires 0.084 inches in diameter, and again covered with tape and 20 hemp cords, each of the steel wires being covered with tape and preservative compound. The steel wire has a breaking strain of 84 tons to the square inch. By adding the hemp cords, the tensile strength is increased and the specific gravity reduced so as to enable the cable to be laid in very deep water. The total breaking strain of this cable is about 6 tons, and it will bear about 10 miles of its own length in water.

Western Union Fire at Pittsburgh.—A fire occurred this week at the Western Union office, Pittsburgh. The first reports made it appear serious, but everything was in working order the next day. The fire was caused, it is said, by defective insulation of the office circuits.

Electric Eels.—An electric eel three feet in length and weighing seven pounds was caught by fishermen in a net off Gravesend Bay and brought to Fulton Market last week, where it has been giving shocks more or less severe to a crowd of curious sightseers. Electric eels are rarely taken in Northern waters.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
NEW YORK, Aug. 16, 1886.

Mr. Albert Swan, general superintendent of the Vitrite Manufactory at Gateshead, England, arrived here on Sunday per steamer "Celtic," bringing with him a large quantity of machinery from those works, to be set up again at East Newark, N. J., where the Vitrite and Luminoid Company own an extensive factory property, purchased some time ago for the manufacture of its specialties, the demand for which is rapidly on the increase. Mr. Theo. Mace, the general manager of the company, is still detained in Europe, looking after the interests of this growing industry, and may not return before Sept. 1.

The Okonite Company has furnished the Johnson Electric Valve Service Company with over 150,000 feet of three-conductor cable within the last few months. The company says it will either have to increase its plant or ask its friends and customers not to order quite so much wire and cable.

The New York Leather Belt Manufacturing Company, 38 Ferry street, whose product keeps many an electric light station active, has very extensive facilities for the manufacture of leather belting. It tans its own leather at its own factories, and has a large establishment in Brooklyn, where it makes nothing but belting.

At the semi-annual meeting of the Association of Edison Illuminating Companies, held at Long Beach on August 12, there were present: Mr. Thos. A. Edison, Mr. E. H. Johnson, Mr. F. S. Hastings and Mr. J. H. Vail, besides 25 other gentlemen representing the Edison central stations throughout the country. One important step taken was the indorsement of Mr. C. J. H. Woodbury's plan of mutual fire insurance for electric light companies. The Association decided to co-operate as soon as plans were perfected. Mr. Jenks made some remarks on street lighting with reference to the Edison system. A resolution was adopted to the effect that all the sub-companies give the parent Edison company their hearty co-operation and support in the fight to sustain and enforce the Edison incandescent lighting patents. A standard system of central station accounts was recommended by the executive committee and adopted. A very active discussion arose on the topic of electric motors. Mr. Sprague took the opportunity to explain his system. There seems to be no doubt that the companies will push this matter "for all it is worth." The Association adjourned to meet again in February, 1887, exact date to be fixed by the executive committee. The Edison central station business now embraces fifty companies supplying light from about 160,000 incandescents, and employing a capital of about $5,500,000. All this large industry has been developed inside of 3½ years, making it unquestionably one of the most striking growths of the age, though one still in its earlier stages.

Mr. C. McLaughlin, of the firm of J. H. Bunnell & Co., 108 and 110 Liberty street, took a trip West last week, stopping in Chicago, where arrangements for an agency have been made, as your Western representative will probably note. Mr. B. Blum, of the same firm, has taken a trip as far West as Council Bluffs, combining pleasure with business.

Mr. E. G. Bernard has recently put plants of the Consolidated Company's system at J. W. King & Co.'s, Waterford, N. Y., 75 lights; 1 machine; Waterford Knitting Company, 150 lights, 1 machine; Walker & Williams, Cohoes, N. Y., 50 lights, 1 machine; Troy Waste Company, 50 lights, 1 machine; Diamond Knitting Mill, 75 lights, 1 machine.

Some Brooklynites are about to form a company to insure against the burial alive of those who are members. In the suburbs, probably in the vicinity of some of the large cemeteries, edifices will be erected fashioned to hold a large number of coffins. These receptacles will differ materially from tombs, for there will be no strongly bolted doors, nor will the coffins be placed in tightly closed chambers from which even a perfectly well and strong man would stand no chance of escaping. On the contrary, the coffins will be ranged about with open lids, and will remain in the receptacles until the bodies they contain show signs of life or are proved by decay to be dead. Means will be provided so that if a person in any of the coffins should be alive he could immediately upon discovering that fact communicate it to an attendant and receive the proper aid. It is not known yet whether this communication will be made by means of a speaking tube or telephone placed in each coffin or by a cunningly arranged system of electric bells. Possibly a competitive trial of the three may have to be made. Mr. Henderson Benedict, of Brooklyn, has been engaged by the philanthropic citizens to get them incorporated for the object they have in view. He is as yet unwilling to give the names of any of his employers, but expects that within six months everything will be in working order.

Mr. Goff gives me the following: Many of your readers, if not acquainted personally with Mr. Eugene Ingold, the proprietor and General Manager of the Pittsburgh Electric Co., of Pittsburg, Pa., know of the great success attained by him in the electric lighting business. Mr. Ingold began his electric lighting experience about 8 years ago, and was associated with Mr. Brush, the inventor and founder of that system, for several years, as one of the most successful salesmen the Brush Company ever had connected with it. He sold Brush apparatus in the city of Pittsburgh alone sufficient to operate 1,800 lamps. Mr. Ingold adopted the Thomson-Houston system about one year ago. He has been in New York for several days making a very careful investigation of the American Company's apparatus, and was so well pleased with the results that he has given up all connection with other arc lighting companies, and has accepted a general agency from the American Company for Western Pennsylvania, Ohio, Kentucky and West Virginia, with headquarters at Pittsburgh.

W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, August 14, 1886.

Mr. Josiah Quincy has been elected managing director, and Allan V. Garratt superintendent of the Chemical Electric Light and Power Company. The directors are Gen. Stephen M. Weed, J. Murray Forbes, Wm. B. Bird, James H. Howard and Josiah Quincy. Among the principal stockholders are the first four gentlemen and Col. Hugh Cochrane, John H. Sturgis, Joseph S. Fay, Col. H. S. Russell, John C. Palfrey, Mr. C. E. Perkins, A. E. Touzalin, William C. Goldner, J. Howard Nichols, F. W. Sargent, Walter Hunnewell and Frederick Amory. It is proposed to increase the capital stock by paying in $25,000 in cash for 2,500 new shares. The stability of the Company's patents and the entire practicability of its system of lighting for private residences, railway cars, yachts, etc., is now fully established by unanimous opinion of patent experts and genuine demonstrations extending over a period of nearly one year. A contract for the State of Pennsylvania is engaged by Messrs. Richard Packer and I. A. Cochrane, Jr., of Chester, Pa., upon terms which have been established by the company to apply to all exclusive licenses made hereafter. Mr. Wm. C. Goldner, who has been connected with the company from the start, and who has devised nearly every battery, switch and other means of utilizing the Volta-Pavia solution, has been engaged by the Chemical Electric Light Company, of London, to take charge of its electrical department, and sails for London on the "City of Rome" the 18th inst. The Boston Company loses an able and experienced helper by this change, and the London is to be congratulated upon acquiring so competent an authority on primary batteries.

W. I. B.

HARTFORD, Conn., August 16, 1886.

The Electric Company of this city reports the orders for its system of electric lighting during the past two months as being more than double those of the corresponding period of 1885.

The Eddy Electric Manufacturing Company says: "Business has been very good with us this year; and particularly so during the months of June and July. We are just completing another of our very large dynamo machines for refining bullion, electro-plating, electrotyping, etc., etc.; and shall begin several more soon."

Divers in 30 ft. of water at Holyoke dam, near Hartford, have kept up communication with the men at the pumps by means of telephones. The wire runs down and through the helmet to a small telephone, so that the diver can control the operations of the hoisting engines more directly than by the old system of signals—by jerking a life line.

Messrs. M. J. Wightman and Hermann Lemp, electricians at the factory of the Schuyler Electric Light Company, have been experimenting at the station of the Hartford Electric Light Company with an ingenious device, of which they are joint inventors. It is a series-incandescent lamp having an automatic cut-out, and is so constructed that on the filament becoming burned out or broken while in use, an arc is formed by the melting and fusion of a copper strip inside the lamp. These lamps can be used, it is claimed, on any arc-light circuit, and are especially adapted for incandescents grouped in series.

The Schuyler Electric Light Company employs a much larger force at its offices and factory than at any other time since its organization. Notwithstanding its extensive manufacturing facilities, the company has its hands full to keep up with orders.

The Jewell Belting Company reports business as being very satisfactory for this period of the year. This old and widely-known concern has of late given special attention to the wants of electrical people in the line of belting, and to that end is manufacturing an assortment of belting of various sizes and lengths for use on dynamos.

The Hartford Steam Boiler Insurance and Inspection Company is rapidly increasing its business in the electric lighting field, not only in the New England States, but also in the South and West and in Canada. The aim of this company is to co-operate with and advance the interests of electric lighting stations by careful inspection of boilers; and in cases of accidents, the prompt payment of risks.

The Waterhouse Electric Light Company has been running for nearly a month two of its dynamos at the station of the local electric light company in Hartford, and has had during that time 45 arc lights burning all night on a seven-mile circuit. These lights are distributed all over, and in the streets surrounding, the beautiful park, in the centre of which stands majestically the capitol of Connecticut. The lights burn clearly and evenly and diffuse their light satisfactorily, and the Waterhouse Company is deserving of congratulation for its success in producing a good system of electric lighting.

W. I. B.

BRIDGEPORT, Conn., Aug. 16.

Mr. Lowe, of the Bridgeport Boiler Works, said to me last week, regarding their productions:

The works have the reputation of making the most reliable and best-wearing boilers of all kinds. Their system of making boilers has always been to put the best metal the country affords in all parts of the boilers subjected to the fire or heat, and the other portions of a reliable stock which will outlast that which does the work, and the result of this policy is found in the fact that it is a rare thing for any of their boilers to need repairs or to be irremediably damaged by carelessness or accident. All the regular boilers are made at these works in the best proportions. The horizontal tubular boilers are furnished either with or without domes, and with plain or improved fronts, and with the Lowe improved furnace for burning any fuel or mixture of fuels and getting the most useful effect from it and preventing smoke. The Lowe boiler is also made at these works. This boiler is on the same principle as the leading English and Continental boilers, which have held their place against all others up to the present time. The Lowe boilers are simpler than the type named, and therefore cost less per horse-power, and they are more economical of fuel and space occupied, and their endurance has been proven equal to any. In fact, the Lowe boiler carries the lowest first cost of any on this system, with the maximum of endurance and saving of fuel and minimum of cost for maintenance. The Lowe boiler is also furnished with either dome or steam superheating drum on top, and with or without improved front and furnace. This boiler has a reputation second to none, and all kinds of fuels and mixtures of fuels have been used in the furnaces since its introduction with the best results and satisfaction. The Lowe feed water heater is another specialty made at these works, and there is not a more simple or effective one in the market of the system of purifying heaters, or one that costs less per foot of heating surface. Eight years' use has proven all

claims for it to be as guaranteed. It will be seen that all the requisites of boiler and heater plant can be furnished from my works, either plain or with all improvements for obtaining the most useful effect from the fuel.

The telephone exchange in this city has 530 subscribers, and it is so ably managed that additions are being constantly made to the business houses and private residences on its list. Mr. Geo. E. Betts is the manager of the exchange, and Mr. A. F. Spencer is in charge of construction and repairs. This exchange has under its control quite a large division including and connecting Bridgeport, Newtown, Danbury, New Milford and Falls Village: and has 875 subscribers in all. A new line is to be constructed from New Milford to Falls River direct, thus connecting up the entire Housatonic Valley.

Messrs. S. H. Hoggson & Co., manufacturing and practical electricians, of this city, have offices at their factory, No. 19 California street, instead of at the former stand, under the Atlantic Hotel. The patronage of this firm has nearly doubled since the above change. Mr. Fred H. Gardiner, formerly manager of the Rhode Island Telephone and Electric Company, of Providence, is at present connected with this live and enterprising firm.

The Deoxidized Metal Company is the name of a new enterprise recently established in this city, with factory and offices on Railroad avenue, near the corner of Park avenue. This company manufactures deoxidized copper for electrical purposes, for which it claims that it "resists sulphuric acid and is of a higher conductivity, strength and torsion than any other wire now being used."

W. I. B.

NEW HAVEN, CONN., Aug. 14, 1886.

The telephone office in this city, operated and controlled by the Southern New England Telephone Company, is really one of the best-managed and most thoroughly-equipped exchanges in this section. Under the management of Mr. H. B. Frost, with an experienced staff of assistants, this exchange has been a successful and good-paying enterprise from the start. For some time past long distance telephony has been satisfactorily carried on between this exchange and New York, and the company is daily placing on its books subscribers for this special and important branch of its business.

The New Haven Electric Light Company has in use 51 city lamps and 249 commercial, all arc lights. Recently orders have been coming in so rapidly for additional commercial lights that the company has decided to increase the capacity of its plant. Ground has already been broken for an additional building 50 × 175 feet, in George street, in the rear of and adjoining its present station. It is to be equipped with a sufficient number of Armington & Sims engines and Thomson-Houston dynamos, to enable the company to furnish just double the number of arc lamps now in use. This company intends to add an incandescent system to its business, to cater to the existing demand among its present patrons for that kind, there being numerous instances where both the arc and incandescent systems of lighting can be supplied to the advantage of the producer and consumer alike.

W. I. B.

PHILADELPHIA NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
PHILADELPHIA, Aug. 16, 1886.

Crowds of people nightly visit the scene of operations along the line of the new Baltimore & Ohio Railroad near the Park. Electric lights extend all along the tunnel, from a point opposite St. Francis Xavier's Church, below Spring Garden street, to Fairmount avenue, and the workmen are all busily engaged at night digging and removing the soil, and lowering the stone into the cut. Every night the cut is visited by people living up in that section of the city. It can be seen as well at night as in day time, owing to the brilliant electric light, and there is no hot sun to seek shelter from in the cool of the evening.

The Dime Museum here is to be lighted through and through by the electric light. Its manager has just closed a contract with an electric lighting company, which will run wires all through the building and will make it one of the most brilliantly lighted places in the city. This will absolutely destroy all danger of fire. In the cosey little theatorium the stage will have electric foot-lights with different-colored globes, thus giving a very pretty effect on the handsome scenery and the gay costumes of the actors who will walk the boards of the stage. The People's Theatre in New York is, I believe, the only other one in the country whose stage is similarly lighted.

The stockholders of the Baltimore & Ohio Telegraph Company in Pennsylvania, which is the line owned and operated by the railroad company whose name it bears, held a meeting last Wednesday, at which it was decided to sell all the property and franchises of the corporation to the "Baltimore & Ohio Telegraph Company of Pennsylvania." Upon the conclusion of the meeting, President D. H. Bates said: "This action was taken simply to consolidate the Baltimore & Ohio's interests in this State. The original charter of the company was not sufficiently comprehensive to cover all the territory that we desired to enter, and all interests are merged under another and more satisfactory charter."

The "special delivery" system, by which the Government entered into competition with the local district telegraph companies, is now a pronounced and very flat failure. There were only 3,800 special delivery letters delivered in this city in July. Nearly 12,000 were delivered in October last, the first month in which the system went into effect.

Ex-Chief of Police Samuel Irvin Givin has left the American District Telegraph Company, of which he was general manager, to become manager of the Electric Pneumatic Tube Company.

Electricity has found a new competitor as a locomotive power. The Baldwin Locomotive Works are now engaged as an experiment in the construction of what are known as soda engines. They are run by means of impregnating soda with steam, which heats the soda, and takes the place of coal under the boiler. The soda can be used many times by heating it with the steam until it is perfectly saturated with water. These soda engines are to be used as street car motors in Minneapolis.

This soda engine reminds me of a recent test made of the Keely motor. Keely is laughed at in all directions, but he has many firm believers and friends, and his last experiment with his new "force" is interesting to electricians, because it may, if it is genuine, be the means of some remarkable electrical improvements. As Mr. Keely claims to get immense power from vibration, and as our modern theories of light, heat and sound are based upon vibration, and if we can crowd sufficient vibrations into a second of time, we can then *see by telegraph*. Mr. Keely's ideas merit close attention. At his recent test he had a number of tuning forks set up, and by playing on a violin put them all into unison, and from those vibrations he seems to have obtained immense power. Of course, there is a good deal of skepticism, but Dr. D. Hayes Agnew, one of the distinguished surgeons who attended President Garfield, and who has some clear ideas on the subject, seems to think there may be a new force. Dr. Agnew was present at the Keely test the other day, and this is what he said to a reporter about it:

"I do not know whether to believe or disbelieve Keely's claims. He says he disintegrates atmospheric air by sound vibrations, and I am not sure that he has not discovered some new force with unknown properties, for I know the power of vibration. When a man is struck on the head with any heavy instrument and the skull is fractured, it is not fractured where the blow falls, but at a point where the vibrations concentrate, say at the lower end of a triangular bone. So physicians often find the strongest bone in the skull fractured by a blow that never touched it, but was struck upon the top of the head. Let me tell you another instance of the power of vibration. The tramp in unison of a body of troops over a strong bridge, if there are a large number of soldiers in line, will break the bridge down. This is on account of the vibrations increasing in intensity as the troops keep passing over the bridge. An important bridge in France once fell from this cause. It is the custom now to 'break ranks' when troops cross long bridges. We have experimented at the University Hospital upon the power of vibrations to break skulls where the vibrations concentrate. Again and again when a blow was given at different spots upon the summit of the skull some bone was broken farther down, where the vibrations connected. At Keely's exhibition, though I did not stay very long, I saw enough to suggest the probability of his having some great force. The 550-pound weight at the end of the long lever was raised at once when he opened the throttle of the liberator, showing an apparent pressure of 18,000 or 20,000 pounds to the square inch. There was no compressed air about it, for when the 'force,' whatever it was, was released, no cold was perceptible, as would have been the case if compressed air had been used. Keely may have a force that is so different from any known that we cannot now gauge its possibilities or properties."

There ought to be food for reflection here for Mr. Edison and some other of our studious friends.

Last week Easton, Penn., a thriving town on the upper Delaware, was in a fever of excitement over the inauguration of the system of electric lights in the streets. Early in the evening all the town and his wife was out, and they had a brass band to greet the expected outbreak of effulgence, as soon as the current should be turned on. Just about the time when curiosity was at its height, an unknown wag lowered one of the old lamps below the square, and in place of the carbon put a light tallow dip, which hanging in mid-air excited no little degree of attention. At first the uninformed supposed it to be one of the new lights, as yet not in complete and perfect operation, and patiently awaited results, while others became carping critics and prophets of evil, and at once began to condemn the system, anathematize its projectors and sermonize on the expense. In the midst of their babbling the genuine light streamed upon them, and recognizing their error, they left amid the laughter of the spectators. A similar joke was perpetrated in other portions of the town. The machinery employed consists, when all the circuits are complete, of 2 engines and 2 boilers, with a capacity of 120 horse-power, 3 dynamos, 12 miles of wire and 64 lamps.

The employés of the Brush Company appear to be very well pleased with their Beneficial Society and with the course of lectures on which Mr. M. D. Law has started them. The hour spent the other evening over static electricity, illustrated by experiments, was most enjoyable and profitable. I venture to predict that some of the men will soon show that they have really profited by their study of electrical subjects.

The Electric Pneumatic Tube Company is settled in its new quarters at 422 Library street. Mr. H. Clay, the successful electrician and inventor of the system, has formed a strong organization, and is looking forward to the early execution of large contracts.

Vallee & Co., 1210 Market street, formerly the Independent Electric Company, have decided to give their attention to the wholesale and retail business of furnishing electrical supplies of all kinds. They have an excellent central location and good facilities for a large business. They have also the merit of being young men with an ambition to excel.

A. F. Moore, 200 Third street, has secured the premises 301–3 Race street adjoining, now in course of reconstruction. He is putting in a new line of improved machinery for covering wire.

Mr. James Garnett, manager for the Shultz Belting Company, is summering in the Allegheny Mountains.

I visited, a day or two ago, Mr. H. M. Sciple, the manufacturer of the Sciple "electric" engine, etc., corner Arch and North Third streets. Nearly a year ago he put a 25 h. p. engine and boiler with all his attachments called "electric"—damper regulator, governor and injector—in the establishment of Leller & Co., wine merchants. I went with Mr. Sciple into the sub-cellar, and there saw a plain slide valve engine running at 450 revolutions a minute, and operating by means of countershafting a 125 light Schuyler incandescent machine, a 15 arc light machine, a 5,000 pound elevator, carrying about 2,000 pounds, two bottle-washers and a corking machine. The lights are furnished with satisfaction to brokers and others on the block. The engine works perfectly. Mr. Sciple holds that to cater for electric light trade you must have first-class apparatus and appliances, all of which he thinks he has, and which he sells under guarantee. Another place I visited to see one of his "electric" engines was Webster & Sons, 1616–18 Ridge avenue, where there is a Ball dynamo running 8 arc lights. It is considered one of the finest isolated arc plants in the city, and the engine room is called the "parlor engine room." At Oxford, Pa., Mr. J. W. Bowman, fancy goods store, running a Thomson-Houston incandescent plant with one of these engines, supplies the Methodist Church and gets his own light for nothing, as well as clearing the cost of the plant. Cooper, Hewitt & Co. have an "electric" engine running an arc machine at Durham Furnace, Pa.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, Aug. 14, 1886.

I visited St. Louis this week, and found the electrical business to be very flourishing there. The Shultz Belting Company are nearly sixty days behind their orders, a considerable proportion of which are for electric lighting plants. Your readers are well acquainted with the excellent reputation of the Shultz belt, and with the particular process of tanning which it is subjected to. As an indication of the high favor in which this belt is held by practical electrical light men, I subjoin a copy of a letter recently received by the Shultz Company from Mr. W. L. B. G. Allen, Secretary of the Brush Electric Association of St. Louis: "We desire to express to you our opinion of your belts made for us and now in use at our lighting station in this city. We have in our varied experience used all or nearly all kinds of belts, and have never found a belt which would give us the satisfaction yours has done. We need in our business a perfect transmission of power—no slipping of belts, either caused by rivets or looseness, can be allowed; with your belts we have nothing of the kind. To illustrate, some four months ago we purchased a belt, and had it made endless, and placed on a machine connecting straight with engine; that belt has been in use every day since; all the tightening we have done is to pull the machine away from the engine just one inch. Our other experiences with your belts have been the same. We should be happy for you to refer any one to us for reference as to the excellence of your belts for running electric lighting apparatus." The Shultz Company's latest order is for the belting for the electric light outfit at Vincennes, Ind.

The Parker-Russell Mining and Manufacturing Company report no diminution in sales, but rather a healthy increase. Their carbons have always been kept up to a high standard of excellence, and their works are always pressed to their fullest capacity. Probably both Mr. Parker and Mr. Fishback will be at the Detroit convention.

The St. Louis Illuminating Company, operating under the electric light patents of Mr. Charles Heisler, are doing an extensive business. They furnish incandescent lamps of from 30 to 250 candle-power, and are in a position to equip complete central station and isolated plants for incandescent lighting. They have had more than fifty isolated plants in operation at St. Louis alone for over a year, and thousands of their lights are burning nightly in different parts of the country.

Mr. P. C. Burns, representing the Railway Telegraph Supply Company throughout the Southwest, has a very convenient and centrally located office at 210 N. Third street, St. Louis. He is within a few doors of all the different buyers in his line. Mr. Burns's trade is already quite important, and bids fair to become large in the near future.

The Pond Engineering Company, 707 and 709 Market street, St. Louis, report considerable business in their electrical department. They have just furnished a 50 horse-power steel boiler, set with Jarvis furnace and Sheffield grates, and a Blake pump, to the Mendota (Ill.) Electric Light Co.; a 60 horse-power Armington & Sims engine to the Kansas City *Times*, with pipe work and shafting; a 25 horse-power Armington & Sims engine, with boiler, injector, pipe work and setting, to the Kansas City Dime Museum; a 35 horse-power Armington & Sims engine to John Plate & Co., South St. Louis, platers of copper on iron. They are now finishing up a complete station for the Vincennes (Ind.) Electric Light and Power Co., comprising two 42 horse-power Armington & Sims engines, two 50 horse-power steel boilers, set with Jarvis furnace and Sheffield grates, Lowe feed water heater, Blake pumps, Korting injector, pipe work, belting, etc. They are also putting a 175 horse-power single disc Armington & Sims engine into the Western branch of the National Home for Disabled Volunteer Soldiers, near Leavenworth, Kan.; a 35 horse power Armington & Sims engine for the Baldwin-Teuterberg Billiard Hall, St. Louis; a 14 horse-power Armington & Sims engine for the M. A. Seed Dry Plate Co., Woodland, Mo.; and a 60 horse-power Armington & Sims engine to drive Thomson-Houston lights at the St. Louis Exposition, being the third engine of this make in use by the Exposition and Music Hall Association.

The good people of Appleton, Wisconsin, turned out the other day to witness the initial trip of the first car on the Van Depoele electric street railway. Probably nothing but a circus could have got a crowd of like proportions together in that bustling little city. The citizens were no less interested in the success of the project than the company, and when the car made its appearance it was the cynosure of all eyes. In the afternoon, when the trial trip was to be made, the crowd about the car became very large, and as many as were able to find a footing on the vehicle were allowed to do so, as it was determined that no conditions should be lacking to demonstrate the ample capacity of the motive power to do what was claimed for it. It consequently happened that, including the small boys, who, as might have been expected, were out in full force, the number of heads counted on the car reached the almost incredible aggregate of 210. Not only were the seats and foot-boards jammed with humanity, but every projection about the wood work was utilized as a resting place for a foot, the equilibrium of its owner being maintained by his holding on to some one else. Small boys who had been unable to secure better accommodations crowded under the seats, whence they looked out as from a prison whose bars were the legs of those more comfortably seated. When ready to start, the weight of the car and load was no less than ten tons. Mr. Van Depoele himself was at the motor, and the trial was an entire success. Many trips were made during the afternoon, and the interested people seemed never to tire of riding up and down the line on the smooth-running car. The street railway officials expressed themselves as perfectly satisfied with the performance of the motor, and Appleton as a whole is highly pleased with its electric railroad. Four more cars will be running in a few days. Two overhead wires are used at Appleton. The pretty daughter of one of the officers of the railway company had been present at the trial trip, and in the evening was asked by her father what she thought of it. She answered: "I thing it is all very nice, papa; but I don't like the horrid smell of electricity." Subsequent investigation showed that she had been standing directly over a defective gas main in

the street, and supposed that the odor was due to the electricity running the car.

The Municipal Electric Lighting and Construction Company of Minneapolis, Minn., report the following later orders: Wiring for the two new stores of Lofgren Brothers, on Washington avenue, south; wiring for the saw-mills of Bray & Robinson, and 100 light Edison dynamo for same; wiring for the new building of the State University for 150 lights.

The Metropolitan Telephone and Telegraph Company of New York is about to indulge in the luxury of a hundred and twenty-five thousand multiple switch-board, having just given the Western Electric Company an order for the largest board of the kind ever made. It will go into the Cortlandt street exchange. Telephone apparatus doesn't cost much. Oh, no; and that's why some people think the companies could afford to give a first-class service for three dollars a month.

The following letter was written by the Secretary of the Alliance, Ohio, Gas Company, Mr. W. W. Cantine, who belongs to the progressive element among the gas managers, and appreciates the fact that it is better wisdom to utilize the electric light than to fight it: "Western Electric Company, Chicago: Your man sent to put up our second dynamo left this morning. Our plant is working admirably. We have the best lighted business street I ever saw, and I have been in all the principal cities of this country. Mr. Starr, Superintendent of the P., Ft. W. & C. R. R., says they have the best lighted railroad yard here there is in the United States. We are justly proud of our plant, which is as good as the best."

The Fort Worth Electric Light Company have just contracted for a 60-light dynamo and lamps of the Van Depoele pattern, in addition to those they already have.

The Nelson Knitting Company, of Rockford, Ill., have just bought a 20-light Van Depoele plant, and R. L. Reynolds, Esq., of La Crosse, Wis., a 16-light outfit of the same make.

Mr. Charles McLaughlin, of the firm of J. H. Bunnell & Co., your city, was in Chicago the first of the week, and while here made an arrangement with the Railway Telegraph Supply Company whereby the latter will assume the Western agency for Bunnell's standard and well-known telegraph instruments and supplies. A complete stock of the Bunnell apparatus will at all times be kept on hand in Chicago, including quadruplex and duplex instruments, repeaters, switch-boards, spring-jacks, cut-outs, pole changers, lightning arresters, American District registers and apparatus, testing and measuring instruments of all kinds, conducting cords, window tubes, wood screws, batteries of all kinds, battery supplies, magnet and office wire, insulated wires and cables, telegraph, telephone and electric light line wire, insulators of all kinds, medical batteries, annunciators, electro bell and gas-lighting apparatus, electro-medical apparatus, construction tools, etc., etc. Bunnell & Co. have selected a live and energetic firm for their Western agents.

Telephone stocks, according to Col. S. G. Lynch, broker, 146 La Salle street, Chicago, stand as follows:

Bell of Mo.	$150@$152
Central Union	45@ 47
Chicago	365@ 375
Colorado	20@ 22
Cumberland	70@ 75
Great Southern	30@ 32
Iowa Union	16@ 19
Michigan	66@ 68
Mo. & Kan.	58@ 59
Rocky Mountain Bell	40@ 45
United	16@ 18
Wisconsin	104@ 106

It is said that Mobile, Ala., enjoys the distinction of being the only city in the world to go back to gas after having tried the electric light. The plant was badly run, they say. Which company will go in and retrieve this loss?

The Electrical Supply Company has lately placed a large Hess annunciator in Jacksonville, Ill.

A mighty storm, accompanied by violent wind and lightning, with its centre in Eastern Colorado and its eastern edge at Chicago, visited the West this week, and signalized the breaking of the great drought by the destruction of much property and several lives. At Hannibal, Mo., the oppressive heat of Friday, which registered 100 degrees, was succeeded about four o'clock in the afternoon by a terrific wind-storm, which came from the northwest, accompanied by heavy black clouds, which burst over the city while the wind was in its fury. Suddenly in the northeast appeared a cloud, lighter than the others, which crossed the Mississippi River diagonally, whirling as it came and lifting up the water in its path. The electric light building, containing the machinery owned and operated by the city, stands on the river bank. The storm struck this fairly in the centre, knocking in all of the north wall and carrying the roof and one smokestack 100 yards to the southwest. James Reynolds, a fireman, was struck in the head with flying bricks, but will recover. The machinery was covered by the falling wall and is considerably damaged. Hannibal was left in darkness Friday night.

At Wayne, Ill., two men were instantly killed by lightning, and at Aurora, Ill., the destructive element visited the watch factory and severely shocked several employés, one of whom is not expected to recover. In Chicago a thunderbolt invaded the State grain inspector's branch office at Centre avenue and Sixteenth street, knocked out a window, destroyed some of the telegraph instruments, and paralyzed the right arm of the telegraph operator. All in the building received a severe shock. Lightning struck a house at Jefferson Park, felling two ladies, and one will probably die. Craig's incubator establishment at North Evanston was visited by a thunderbolt, and a workman was knocked down. Reports from many points visited by the storm bring news of loss of life and property. The sadly needed moisture brought by the storm was a great blessing, but it was accompanied by many deplorable incidents. W. A. K.

THE TELEGRAPH.

Western Union Will Appeal.—The counsel for the Western Union Telegraph Company on August 13 filed notice of appeal to the General Term of the Supreme Court from the order of Judge Lawrence denying the motion for a new trial in the suit of John G. Farnsworth, receiver of the Bankers and Merchants' Telegraph Company.

Ticker Troubles.—Mr. John Anderson, manager of the Commercial Telegraph Company, says that the trial of their injunction against the Stock Exchange, restraining that body from depriving them of facilities for transmitting quotations from the Stock Exchange floor, would come up for action in October, if it ever came up for trial at all. Mr. Anderson said that he looked upon the matter as permanently settled.

THE TELEPHONE.

A New Company.—The Great Western Telephone and Telegraph Company, of Kirwin, Kan., has been organized by Mr. W. D. C. Smith, of Washington, and others, with a capital stock of $25,000.

Kansas City.—The local *Journal* copies in full the recent article in our columns by Mr. D. B. Macquarrie, on the telephone system there, and commends the description to its readers as full of interesting facts and figures.

The Government Suit.—The President has appointed Mr. John Goode, of Virginia, to be special counsel on the part of the United States in the suit instituted at Columbus, Ohio, to test the validity of the patent granted the Bell Telephone Company.

The Cushman Claim.—Dr. S. D. Cushman, General Manager of the American Cushman Telephone Company, of Chicago, has been visiting Cleveland, O., to collect evidence in support of his claim to priority of invention over Professor Bell. He expects to get some more evidence at Minneapolis.

The Limit of Telephone Communication.—Speaking at a recent meeting of he Belgian Society of Electricians, M. Van Rysselberghe summarized the conclusions to which he had been led both by his own experiments and by observation of what had been done in America. He considers that telephonic communication can be carried on in a manner capable of satisfying commercial requirements over a phosphor bronze wire of 2.1mm. diameter for a distance of 500 kilometres, with a wire of 2.7mm. for 940 kilometres, and with a wire of 5mm. diameter over a length of 1,625 kilometres. He is also of opinion that with the 5mm. wire conversation is "sufficiently good" over a length of 3,250 kilometres.

New Uses.—"That's a smart trick a Covington lawyer plays on his sleepy-headed office boy sometimes." "What is it?" "Why, this boy is the laziest, most inattentive youth imaginable, and often goes to sleep when his employer has need of his services. The telephone in the office is 'call three' on a triplicate line, so when the boy dozes off and the boss wants him and can't get him by vocal application, he goes to the 'phone and rings three times, which doesn't disturb the exchange, but does the boy, who jumps up to answer it, the boss having meantime stepped into another room to watch the effect of the ruse. It is ridiculous to hear that red-headed kid shouting into the telephone, rapping on the transmitter and ringing up the exchange to see who called. The boy, however, undergoes this same thing every day, and hasn't dropped to the joke yet."—*Cincinnati Sun.*

Arming for the Fray.—A dispatch from Washington of August 9 says: Solicitor-General Jenks will enter upon the performance of his new duties to-morrow. It is expected at the department of justice that, inasmuch as he will probably direct the suit against the Bell Telephone Company at Columbus in October in person, he will devote a good deal of his time to preparation for that trial. In this connection it is interesting to recall an episode in the examination of Solicitor-General Goode by Congressman Ranney before the Pan-Electric Investigating Committee. Mr. Ranney had gotten a great deal of damaging information out of Mr. Goode in the course of the examination. Mr. Goode's temper was ruffled. This made him very dignified. When Mr. Ranney courteously expressed the hope, toward the close of the examination, that his questions were not irksome, Mr. Goode replied, loftily: "Oh, no; I am here to answer such questions as may be propounded. Your questions do not annoy me." Then Mr. Ranney asked him a searching question about the law of the case, but that he would not answer. "I will argue the law of this case," he replied, still more loftily, "at Columbus in October." To this insinuation that Mr. Ranney would appear at Columbus as counsel for the Bell company Mr. Ranney made no reply.

THE ELECTRIC LIGHT.

Slatersville, R. I.—The work of building a large new dam is to be carried on at night, with the aid of an arc light plant.

Westerly, R. I.—Electric lights are soon to be placed in the mills of Carmichael & Tyler and the Carmichael Manufacturing Company, all in Westerly.

Saginaw, Mich.—The Saginaw Electric Company, of East Saginaw, Mich., has been formed, with a capital stock of $50,000. Mr. W. A. Avery is interested as an incorporator.

The National Electric Company of Chicago has just been organized with $100,000 capital stock. The incorporators are E. J. O'Brien, W. H. O'Brien and G. Sarvin.

Demerara.—The American Electric Manufacturing Company last week completed arrangements for the opening of an agency in Demerara, South America, for British Guiana and the West India Islands.

Lawrence, Mass.—The new 300 arc-light plant installed by the American Company in the Arlington Mills, at Lawrence, Mass., is giving excellent satisfaction, and Treasurer Whitman is said to be already contemplating an increase of capacity.

Jacksonville, Fla.—The American Company, of Jacksonville, Fla., is very busy, and it is said it proposes to nearly double its present capacity during the coming fall. This company is owned and officered by the stockholders of the local gas company.

Hornellsville, N. Y., seems to be mightily well pleased with its American system. The local *Times* says: "We believe the almost unanimous opinion is one of unqualified satisfaction," and it quotes the testimony of prominent citizens as to the steadiness and brilliancy of the lights.

A Big New Cruiser.—The plans for the large unarmored cruiser for the United States navy, included now in the list of those to be built, and for which proposals will be invited, provide that she shall have arc search lights and a complete incandescent system. She will be the most powerful vessel of her kind afloat.

Augusta, Ga.—The American Company have just closed a contract with the present electric light company in Augusta, Ga., to reorganize under the name and style of the "American Illuminating Company, of Augusta, Ga.," and have contracted to add 100 lights of the American system to the present plant.

A Boston Clothing Store.—The Jarvis Engineering Company, 61 Oliver street, Boston, has received the contract to put in a complete steam plant for the Continental clothing house (Freeland, Loomis & Co.), Washington street, Boston. It will consist of two steel boilers set with the Jarvis patent boiler setting, and using National rocking grates, Armington & Sims Company engine—to run cutting machinery and electric lights—National feed-water heater, Korting injector, etc. The Continental clothing house was the first store in Boston to install electric lights from its own power.

Evansville, Ind.—We learn from an interview with the officers, says the local *Call*, that the gas company are much pleased with the system of the electric light (Thomson-Houston) adopted by them, and with its results. The engine and two dynamo machines are taxed to their utmost capacity, and the demand continuing, they find necessary and will put in an extension of their plant at once. They have acted very promptly in the matter, and already placed their order for a 150-horse power engine and a large new steel boiler, with all the necessary shafting, pulleys, pumps and heaters. The machine will be so arranged that a derangement of one part will not cause an entire stoppage, and consumers will thereby be assured of a continuous supply of light. The officers of the company say that no pains will be spared to make this the most complete electric light plant in the State.

An Electric Lighted Oil Steamer.—The new German steamship Gluckauf, which arrived at New York recently from Newcastle, was built expressly for the oil traffic, and will carry oil in bulk across the Atlantic. The oil which she will land in Europe will be conveyed in tank-cars to the leading markets. This will enable American oil to compete with Russian oil, which is sent to the markets in a similar manner. The Gluckauf measures 2297 tons gross and 1508 tons net. She is 299 feet long and 36 feet beam. There are sixteen tanks for oil in the hold. These tanks have a capacity for 2600 tons of petroleum. The vessel is barkentine rigged. The only openings into the hold are manholes in the deck. The engines and boilers are in the after part of the vessel, and are cut off from the oil-tanks. In order to insure further safety the vessel is lighted throughout by electricity.

Fluted Carbons.—Sir James Douglass has brought out for arc lighting a new form of carbons which are held to give a higher efficiency than the ordinary cylindrical pencils now used, and to be especially applicable to the electric illumination of lighthouses. The carbons are fluted down the sides, but are made in molds and baked, much in the same way as ordinary cylindrical carbons. The greater efficiency is mainly due to the fact that the new carbons do not "crater" at the points, and hence there is not the same loss of light from that cause as occurs in the round carbons. Many experiments have been made with them, and it is probable that they will be adopted for the intended flash lights of the St. Catherine lighthouse, England. Two De Meritens magneto dynamos—the same, in fact, which were used at the South Foreland experiments—are to be employed there, one for clear weather, and both together for thick weather.

Photometry.—A neat method of indicating the precise rate of consumption of candles, used in photometrical work, has been carried out in Germany. The candle-holder is hung in an unequal arm balance, the beam of which has a long pointer hanging down from the fulcrum for marking the position of the balance on a vernier scale. At the two opposite ends of the scale there are two metallic pins, while a movable pin, in electrical connection with a battery and a bell, is arranged in the middle of the scale. The candles are lighted and weighed until the pointer just swings clear of one stud of the vernier, when a certain weight is placed in a pan provided for the purpose underneath the candles, a clock being started at the same moment. When, owing to the consumption of the candles, the weight placed in the pan is lifted by the weight in the opposite pan, the pointer swings back and touches the pin, which completes the circuit and so rings the bell. By noting the time the candles were burning, the precise rate of consumption of the candles can be easily determined.

APPLICATIONS OF POWER.

Appleton, Wis.—The street railway, Van Depoele system, has just gone into successful operation.

The Daft Company is in receipt of a great many applications for estimates to equip street railways with its system of electric locomotion.

Springfield, Mass., will soon have an independent electric power station to operate Sprague electric motors. A start will be made with about 50 horse-power in a few days.

The Julien Car.—The Julien Electric Company, controlling for America the Julien car, so successful in the Antwerp tests, has been organized by Mr. W. Bracken and others, with a capital stock of $1,000,000.

The Union Electric Company, of Chicago, with which Mr. Fitzhugh, of the New York Subway Construction Company, is prominently connected, will manufacture motors for street and elevated tramways.

Providence, R. I.—The operating room of the telephone exchange is cooled by a windmill fan, driven by a Daft motor operated by the Providence Electric Power Company, from its plant at the Harris-Corliss engine works.

Baltimore, Md.—The Brush Company has put about 200 motors on its arc circuits. The factory of Staus Brothers, clothiers, is to be equipped with about thirty Baxter motors, of the type now being built by Morrison's Electrical Works.

Boston Street Railways.—The directors of the Metropolitan Horse Railroad Company, having voted to introduce either electricity or cables, will send a committee appointed by President Calvin A. Richards, to New York, Philadelphia, Chicago and other places, to investigate the working and merits of both systems.

Des Moines, Ia.—The Edison Company has put in several

Sprague motors. One runs a printing establishment. Another is used in a livery stable to run the elevator for hoisting buggies, to pump up water and to brush down the horses. A third motor operates a scissors-grinding outfit. A fourth runs the polisher in a plating establishment. Several others are in use in Des Moines, and it is expected to replace with them some water elevators this fall. The motors are giving great satisfaction.

The Boston Street Railways.—Speaking of the decision recently arrived at by the street railway people, the Boston *Advertiser* says: "The system that the committee recommends will, undoubtedly, be adopted by the directors for use on the long lines of the Metropolitan, and eventually all the lines will be run by the same system. Under the act of the Legislature authorizing consolidation of the street railways of this city the use of cable power is authorized, but nothing is said about electricity. Should the Metropolitan decide that the latter power is preferable, there would necessarily have to be further legislation, but it is believed the needed legislation could be secured without opposition next winter, and that would probably be as soon as the 'plant' could be introduced."

PERSONALS.

Mr. George H. Wadsworth, of the National Carbon Company, has resigned his position with that concern, and is now representing the Cornell Platform and Coupling Company. He will probably meet his old electrical friends during their visit West.

John Wiley & Sons.—The *Mail and Express* publishes a very pleasant interview with Mr. William H. Wiley on the subject of scientific literature, and says: "Mr. John Wiley has probably had a longer connection with the business in which he is still engaged than any other publisher in the country. His father, Charles Wiley, was his predecessor in the business, and was the first publisher of the works of Fenimore Cooper." Mr. W. H. Wiley expresses his belief that American engineers take the lead except in the subject of sewerage.

MISCELLANEOUS NOTES.

A Good Suggestion.—From the account which we publish to-day of the fire that broke out yesterday on the French steamer "Labrador" it appears that no very satisfactory explanation of the accident can yet be given. Fortunately, the promptness, skill and energy of the steamer's officers quickly turned what at first threatened to be a serious disaster into one of minor moment. But this fire, which broke out and made considerable headway in the steamer's linen room before it was detected, illustrates the importance of having all parts of a passenger ship in which spontaneous or other combustion can occur, electrically connected with the bridge, so that a fire breaking out will automatically alarm the officer in command. This can be done by the use of a telethermometer, and in other ways which will readily suggest themselves to shipbuilders.—*New York Herald.*

The New Haven Clock Company is establishing an electrical department in connection with its Chicago, Boston, London and Liverpool offices.

The Duration of a Lightning Flash.—Some curious information has been given lately on this subject. Mr. A. S. Barker photographed outside objects, on an excessively dark night, by the light of lightning alone. The wind was strong and the interesting feature was distinctly brought out, when the plates were developed, that the foliage had perceptibly moved during the exposure. The flash therefore must have a measurable interval, probably decidedly longer than the thousandth or ten-thousandth of a second, as got by Wheatstone. His method was of the same nature but the eye was employed as receiving instrument. By using a photographic sensitive plate, instead of the eye, a decided improvement is introduced. The problem is a pretty one and deserves further study, and we commend it to skilled photographers. In actual experiment the photograph should be taken of some object, such as a rotating wheel, of which the velocity is great and uniform.—*American Meteorological Journal.*

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations on the New York Stock Exchange, Boston Exchange and elsewhere are as follows:

Telegraph.—B. & M., b 2, a 3; Western Union, b 65⅝, a 65¾.

Telephone.—Am. Bell, b 187½, a 188; Erie, b 27½, a 28; New England, b 39, a 39½.

Electric Light.—No new quotations.

BUSINESS NOTICE.

Oil for Lighting Plants.—A. W. Harris & Co., Providence, R. I., call special attention to the prices now quoted for their valve, engine and dynamo oils. A 45-gallon barrel can be had for trial on very advantageous terms.

The Gaylord, Cross & Speirs Company, Waterbury, Conn., machinists and iron founders, make a specialty of power, foot and drop presses, which have a high reputation throughout the Naugatuck Valley, as well as all over the country. Their knuckle-jointed foot-press advertised in this issue is a very handy and useful tool, giving an enormous pressure with little exertion. The company make, in addition to presses, all kinds of machines for working brass and wire goods, and are noted for their lathes and drills. The works are busy at the present time in both the machine shop and the foundry department. Estimates on tools will be given on application, and modifications in present product will be made to meet the exigencies of special work.

Anti-Magnetic Shields.—Messrs. Giles Bro. & Co., Chicago, Ill.: Gentlemen: Your Anti-Magnetic Shield for Watches cannot be overestimated. It is now very near eight months that I have worn my watch, and to-day it is, without ever correcting time, about one minute slow. Considering the fact that I am every day near Dynamo-Electric Machines in our regular business, the test could not be harder. I could never have believed that the protection was so complete.

In this age of electricity, not only electricians, but every one who needs correct time, should have the Anti-Magnetic Shield. A good deal of practical utility, as well as pleasure, can be derived from a good time-keeper. At present I look upon a watch without a shield as a thing incomplete; and so it is.

Very respectfully, CHAS. J. VAN DEPOELE,
Electrician V. D. P. E. M. Co.

Address GILES BRO. & CO. for particulars, prices, etc.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

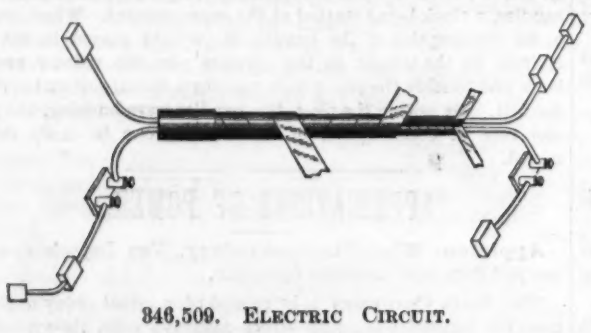
PATENTS DATED AUGUST 3, 1886.

346,465. Railway; Theophilus P. Chandler, Jr., Philadelphia, Pa. It is an improvement upon his patent 305,147, of Sept. 16, 1884.

346,475. Insulator Block; Thomas Hawken, Salem, Mass. Consists of an elongated insulated block mounted upon the wire or conductor and fastened thereto by suitable means, said block being mounted upon the wire at places where the same is liable to be brought in contact with conducting-bodies. The insulator-block, in this instance, consists of a longitudinally-divided block placed upon the wire, and the fastening consists of a piece of wire surrounding the ends of the block and coiled about the wire or conductor.

346,484, 346,485. Railway Signal; Herman H. Liemke, St. Louis, Mo. The first consists of a spring-tie, a bar pivoted to the tie and a contact-cup located under the outer end of the bar, and means for locking the bar to the tie. The second consists of a flap adapted to be operated by the current formed by the motion of the train to close an electric circuit, and means for returning said flap to its normal position.

346,509, 346,510. Electric Circuit; Henry C. Spalding, Boston, Mass. An idle conductor is provided in combination with a circuit and signals therein. The disposition is shown in the cut. The idle wire serves to maintain a state of tension,



346,509. ELECTRIC CIRCUIT.

both in the sheathing and also in the other or active wire. When signals are sent through the latter, therefore, they are accelerated, rather than retarded, if the current be in an opposite direction to that in the idle wire. For this purpose it is only necessary to use such a battery as will overcome the difference of earth potential, as it would even be possible to transmit signals without any battery, depending entirely upon the inductive charge from the idle wire. The second is an improvement upon the first.

346,515. Switch; Robert G. Sweeney, Terre Haute, Ind. The object is to provide a means whereby a single telephone can be used in connection with either of two lines, and at the same time the signal can be received over either of said lines without reference to which one the telephone is connected with. This object is accomplished by providing a separate switch and bell-box to be located at some convenient point near the regular set of telephone apparatus.

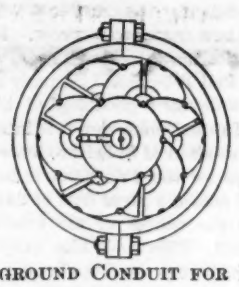
346,527, 346,528. 1. Motor; 2. Battery; John Beattie, Jr., Westport, Mass.

1. Relates particularly to the armature, which has two sets of grooves, the one circular and the other longitudinal; the wire being wound in the latter. The machine embraces, also, a bell governor, which, by the variations of motion, regulates the current.

2. Relates to batteries employed for medical purposes, and particularly to the mechanical construction whereby the circuit may be easily cut out and the zinc or other electrode simultaneously removed from the electrolyte, and the strength of current may be regulated to accommodate the pleasure of the patient.

The nature of the invention is shown in the cut.

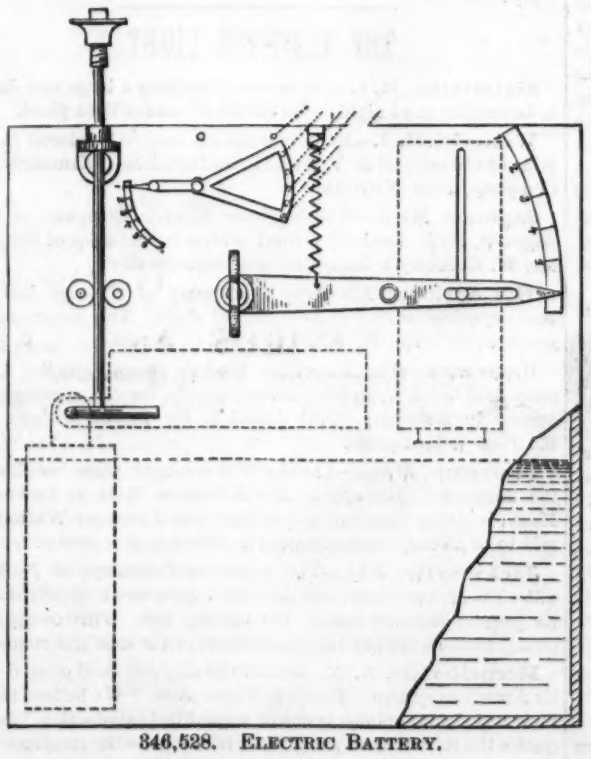
346,532. Electric Alarm; 546,533. Gas Lighter; Charles H. Crocket and Chancellor C. Allen, Boston, Mass. The first relates to the case for an electric call-bell, and consists of a box portion, having a back plate and bearings in one piece therewith for the attached portions—to wit: the magnets, armature, bell and binding-pillars, and a cover fitted movably to the box portion. The second relates to that class of gas burners in which an elongated stem supports the tip in an elevated position to permit the application of an inclosing vitreous sleeve to imitate a candle, and to aid in reflecting light. It consists of details of mechanical construction.



346,688. UNDERGROUND CONDUIT FOR ELECTRIC WIRES.

346,561. Head-Light; George C. Pyle, Dayton, O., Assignor to the American Head-Light Co., Indianapolis, Ind. Consists of a reflector for a locomotive head-light, and an electric lamp the working parts whereof are supported upon a single plate diagonally disposed in rear and to one side of the reflector.

346,587. Alarm; William L. Glanville, Auburn, N. Y. Has relation to that class of electric alarms or appliances for



346,528. ELECTRIC BATTERY.

indicating the removal of any articles from the shelf. There are conductors upon the bottles resting upon the conductors on the shelves. These operate to break or connect the circuit.

346,609. Annunciator; David Rousseau, New York, N. Y. The annunciator has a number of annunciator-magnets arranged in multiple arc circuit with the battery or source of electricity, and a testing-switch arranged to cut the magnets from the multiple circuit and put them into direct or short circuit with the battery in a separate or successive manner.

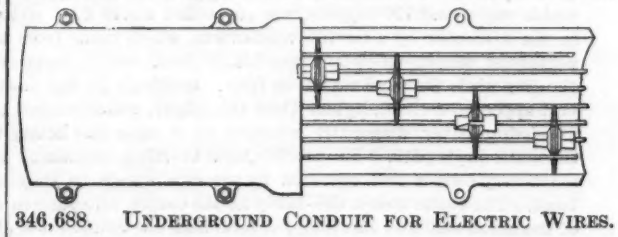
346,645. Machine for Making and Trimming Compound Wire Cables; George M. Cruickshank, Providence, R. I., Assignor to William M. Douglass, trustee, same place. Consists of a machine embodying a frame or housing within which is mounted two geared arbors, each carrying one or more series of disc-like formers and cutters, adapted to respectively corrugate and trim the band-cable continuously, in combination with suitable guide-rolls and a wire-guide mounted on the front side of the frame.

346,688. Conduit; William M. Robinson, Philadelphia, Pa. Consists in providing means, as shown in the cut, for sustaining the wires. Side and end views are shown.

346,708. Telephonic Communication; Chichester A. Bell, London, Eng. The transmitters of several lines are energized by a single battery, which is located at a central point and connected in branch or derived circuit with any group of lines, whereby induction coils and local batteries may be dispensed with.

346,840. Electrical Conductors; Enos Campbell, Minneapolis, Minn. Consists of transversely rectangular front side and top of the upper portion of a shell conduit, having correspondingly-shaped and regularly-interspaced man-holes, pivoting and key-bolted angle-plate shutters, and pivotal and securing foot-grooves made along the lower edge of said man-holes and in the top of the ovate and sustaining basal portion of the conduit shell.

346,846. Telephone Transmitter; Herman Ehrlich,



346,688. UNDERGROUND CONDUIT FOR ELECTRIC WIRES.

Jersey City, N. J. Consists of details of mechanical construction of a carbon transmitter.

346,862, 346,863. Clocks; Alfred Ramel and William W. Dean, St. Louis, Mo., assignors of one-half to Paul Bakewell, same place. The first is an improvement upon his patent 330,923, of Nov. 24, 1885. The second consists in causing the minute-hand of the central clock to rub over a contact-plate extending through a minute-space on the dial (one-half minute, approximately, on each side of the point of twelve), thereby closing one of two breaks in an electric circuit—that is to say, this closing is not used to close an outside circuit, but merely to prepare a circuit—the remaining break in which is closed by a secondary device, which is combined with the second-hand for closing the circuit at the hour only.

346,865, 346,866. Telephone Tolls; Philip L. Rose and Gustavus Rein, St. Louis, Mo. They consist of a chute for conveying the device designed to serve as a toll or indicator to a temporary resting-place or stop, a movable stop at the end of said chute, and a lever or arm forming one with or attached to the ear or hand-phone support, in such manner as to operate said stop for the release of said device from its temporary place of rest on causing the hand-phone support to assume its normal condition or position. In the second they place in the chute at some point between the inlet-opening and the switch lever a trap or gate which, while permitting the ingress of the coin, will effectually prevent it from being withdrawn after it once passes the trap.

346,876. Annunciator Target; Morris Ullman, Washington, D. C. It is an improvement upon his patent No. 232,424, of Sept. 21, 1880.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patent issued since 1866—can be had from this office for 25 cents. Give the date and number of patent desired, and address Johnston's Patent Agency, Potter Building, New York.